

University of Louisville

ThinkIR: The University of Louisville's Institutional Repository

Electronic Theses and Dissertations

5-2019

An assessment of sustainability in Jefferson County public schools (Kentucky).

Elizabeth Ann Ruhe
University of Louisville

Follow this and additional works at: <https://ir.library.louisville.edu/etd>



Part of the [Curriculum and Instruction Commons](#), [Educational Leadership Commons](#), and the [Other Education Commons](#)

Recommended Citation

Ruhe, Elizabeth Ann, "An assessment of sustainability in Jefferson County public schools (Kentucky)." (2019). *Electronic Theses and Dissertations*. Paper 3245.
<https://doi.org/10.18297/etd/3245>

This Master's Thesis is brought to you for free and open access by ThinkIR: The University of Louisville's Institutional Repository. It has been accepted for inclusion in Electronic Theses and Dissertations by an authorized administrator of ThinkIR: The University of Louisville's Institutional Repository. This title appears here courtesy of the author, who has retained all other copyrights. For more information, please contact thinkir@louisville.edu.

AN ASSESSMENT OF SUSTAINABILITY IN JEFFERSON COUNTY
PUBLIC SCHOOLS (KENTUCKY)

By

Elizabeth Ann Ruhe

B.A., B.S., University of Louisville, 1985

M.A.T., Bellarmine University, 1999

A Thesis

Submitted to the Faculty of the

Graduate School

of the University of Louisville

In Partial Fulfillment of the Requirements

For the Degree of

Master of Science in Interdisciplinary Studies/Sustainability

Interdisciplinary Studies

University of Louisville

Louisville, Kentucky

May, 2019

Copyright 2017 by Elizabeth Ann Ruhe

All rights reserved

AN ASSESSMENT OF SUSTAINABILITY IN JEFFERSON COUNTY PUBLIC SCHOOLS
(KENTUCKY)

By

Elizabeth Ann Ruhe

B.A., B.S., University of Louisville, 1985

M.A.T., Bellarmine University, 1999

A Thesis Approved on

July 27, 2017

By the Following Thesis Committee:

Daniel A DeCaro

Russell Barnett

Caroline Sheffield

DEDICATION

This thesis is dedicated to my husband, Joe, who supported my decision to take a year out of my career to go back to school and pursue my passion.

ACKNOWLEDGEMENTS

I would like to thank my thesis advisor, Dr. Daniel DeCaro, for his guidance and advice throughout this entire process and Dr. Caroline Sheffield for the tools I will need to take my learning into the classroom and spread it to others. I would also like to acknowledge my sister, Dr. Katherine Rogers-Carpenter, for advice and perspective from the *School of Been There, Done That*. Whenever I was confused or frustrated, she was able to explain things in a way I could use.

ABSTRACT

AN ASSESSMENT OF SUSTAINABILITY IN JEFFERSON COUNTY PUBLIC SCHOOLS (KENTUCKY)

Elizabeth Ann Ruhe

August 8, 2017

Schools play a vital role in preparing the next generation of citizens to be active, engaged, creative thinkers and problem-solvers. Schools are also large institutions in their communities, employing many people and spending large sums of money. What happens in schools has an impact on their surrounding communities.

Human behaviors are having a significant impact on our planet and changes in our society are affecting the sense of safety and security of our citizens. These are aspects of sustainability that schools need to begin addressing.

This research looks at sustainability practices in a large urban school district to document current practices and to offer recommendations for the future. The research was conducted using semi-structured interviews of administrators and archival data. We found that the school district is consistently working to improve sustainability practices in operations but does little to engage students and teachers in educating for sustainability.

TABLE OF CONTENTS

	PAGE
ACKNOWLEDGEMENTS.....	iii
ABSTRACT.....	iv
LIST OF TABLES.....	v
INTRODUCTION.....	1
DEFINITION OF SUSTAINABILITY.....	6
OVERVIEW OF RESEARCH TOPICS	10
METHODOLOGY.....	14
RESULTS.....	32
SUMMARY OF FINDINGS.....	72
SYNTHESIS AND RECOMMENDATIONS	78
REFERENCES.....	99
APPENDICES.....	106
CURRICULUM VITAE.....	146

LIST OF TABLES

Table	Page
1. Results- Planning and Administration.....	35
2. Results- Energy.....	42
3. Results-Air and Climate.....	49
4. Results- Purchasing.....	52
5. Results-Transportation.....	59
6. Curriculum and Professional Development.....	65
7. Summary of Findings.....	72
8. Overall Score.....	74

INTRODUCTION

One definition of sustainability is “development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” (Meadows, Meadows, Randers, & III, 1972). This project evaluates the sustainability of a major Midwestern school district, helping to support society’s larger effort to meet the needs of present and future generations.

Sustainability is a topic that generates a lot of controversy in the world today for several reasons. The biggest is possibly that we do not want to admit that what we have been doing to the planet in order to “live the good life” is causing irreparable harm and we need to change. Second, with problems so vast, it is easy to succumb to despair, believing that anything you, as an individual do, is not enough. In and of itself, one person’s actions are not enough. But they are sufficient to cause ripples throughout society, gradually changing all. Think about the Civil Rights era. Massive changes rippled throughout society as a result of many individual actions, from Rosa Parks and the Montgomery bus boycott through sit-ins at lunch counters and voter registration drives. These were all actions of individuals who chose to do something different and together they changed the world. In addition, for change to be effective enough, it has to happen on a global scale. It isn’t enough to start building all new buildings to LEED standards. We must also start renovating pre-existing buildings to such high standards. Not only must we change laws to allow for a more equitable distribution of wealth, we must also change corporate and social expectations that put accumulation of wealth as

the highest goal. These changes are big. They are long-term, and they involve changing ourselves as a society.

With changes this big and all-encompassing, it is vitally important that we have a plan. The goal of this research is to measure where the district is right now, and what they can do next on the road to long-term sustainability.

It can be very hard to change entrenched behaviors across the whole of society, and without government support it is nearly impossible. But it is far more feasible to focus our attention on those whose behaviors have yet to form, our children. Society has entrusted educators with their children with the agreement that we will give them the tools they need to be successful adults.

The district that is the subject of this study has six thousand six hundred teachers, one hundred thousand nine hundred students, one hundred seventy-two schools and one thousand two hundred and eighteen buses (JCPS, 2017d). According to district staff, schools and support facilities cover over fifteen million square feet. Any organization this large has a tremendous impact in the community at-large. Thus, it is important to focus on the sustainability of our schools as businesses as well as educational institutions. The administration of a school district sets the tone and guides decisions throughout the district. Therefore, it is important that they have a sustainability plan that guides decision-making. They operate many large buildings. When those buildings need repairs, sustainability and energy efficiency need to be considered. They operate school buses. Those buses must be fuel-efficient, and the routes they drive

must be well thought-out. They also buy a lot of supplies. How those products are produced is important. Cleaning supplies should be free of toxic chemicals. Policies and procedures to support these decisions must be well thought-out and formally adopted to ensure they are followed by all parties. In addition, the vendors with whom the district does business need to be held to the same high standards. In curriculum, students should be learning about sustainability as an integrated part of the curriculum. Teachers should understand at least the basics of climate science and be prepared to talk about how our decisions have consequences, both intended and unintended.

In addition to the environmental aspects of sustainability, we must also consider social ramifications. For example, in order to be fully sustainable, an organization must also make decisions that support poor and marginalized communities. This could mean having policies that ensure small local and minority-owned businesses are given preference in purchasing and efforts are made to ensure that people of all backgrounds and sexual orientations are given equal opportunities to thrive, both behind the scenes and in the classrooms.

In the context of education, social sustainability also includes the need to educate children to be engaged citizens, not only able to see the problems in society, but also inclined to take action to change things. We must begin talking to our children about the planet they are going to inherit. They need to know, not only about the problems, but about the possibility of solutions.

The subject of this research, Jefferson County Public Schools (JCPS), in Louisville, Kentucky is the 27th largest school district in the nation. With over 90 elementary schools, more than fifty middle and high schools and over 100,000 students (JCPS, 2017d), it is truly a large district. JCPS is already involved in sustainability and engaging in important activities to address social, economic, and environmental (built and natural dimensions of sustainability). However, many of these activities are being done internally or behind the scenes, and there has not been a comprehensive study of their activities. Thus, it is not known precisely where JCPS currently stands from a comprehensive sustainability standpoint. The purpose of the current research project is to identify what JCPS has already been doing for sustainability in its administrative operations and curriculum, in order to document progress, identify gaps, and develop recommendations for improvement.

To conduct this assessment, we used assessment criteria established by protostar as a guide for in-person interviews with several administrators at JCPS. Protostar is a comprehensive assessment of sustainability designed to be used as a tool for evaluation and planning in elementary schools. Protostar assess several categories of sustainability planning and action, such as energy conservation, education, building operations, and decision making (planning and administration). The tool was in the testing and development stage when we chose to use it. However, we felt it was the best tool for our purposes. First, protostars is developed directly from The Association for the Advancement of Sustainability in Higher Education's widely used STARS assessment tool for colleges and universities, but focuses specifically on elementary schools.

Second, upon contacting a representative of protostar, they wanted our feedback on its suitability for evaluating an entire school district. The results of the current study can inform the design of protostar. Protostar is likely to become the standard evaluation tool for elementary schools in the United States. Therefore, it seems appropriate to evaluate the JCPS system, using this tool. The current project focused on the aspects of protostars that are the most vital for JCPS: Planning and Administration, Purchasing, Energy, Transportation, Climate, Curriculum and Professional Development.

The body of this paper includes a discussion of the importance of sustainability for society and the value of including it in the curriculum. Space is also given to best practices for teaching sustainability, which turn out to be best practices for teaching in general. Our methodology is explained next, followed by a presentation of the results. The results section discusses not only what the district is currently doing with regard to sustainability, but also what the barriers are to further progress. The last two sections are recommendations and discussion. In the recommendations section, we list possible next steps and prioritize them for implementation. In the summary, we will present an overall picture of the district, where it is now and where it needs to be headed.

DEFINITION OF SUSTAINABILITY

Sustainability is a complex concept and can be conceptualized in many different ways. In the most simple terms, we can think about how people's actions in society impact nature and other people, affecting the long-term welfare and integrity of earth and its inhabitants. For example, societies are using natural resources and degrading resource systems faster than they can be renewed, and pollutants and waste are being created faster than can be safely handled. The EPA estimates that in 2013, the average American generated 4.40 pounds of waste per day, of which only 34.3% was recycled or composted (EPA, 2017 #216). Many societies also have extreme wealth disparities, large gaps between rich and poor (Oxfam.org, 2017), and some types of people in society are treated inequitably based on race, class, and gender. When these types of issues are not properly addressed, societies become unsustainable in the sense that these problems inevitably lead to significant upheaval, and in some cases in history, ultimate downfall. Thus, in one sense, sustainability is about making sure all needs are provided for, and that the earth is robust enough to allow people and nature to flourish.

This idea matches the most frequently used definition of sustainability, which says that sustainable development is "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987). Originally written in 1987 as part of the report, *Our Common Future*, by the members of the World Commission on Economic Development (WCED) who were charged by the United Nations with developing strategies to achieve sustainable development by the year 2000, it is a goal that has turned out to be much more difficult

to achieve than they ever anticipated. A similar definition was adopted in United States's National Environmental Policy Act, which declared it a national policy to "create and maintain conditions under which humans and nature can exist in productive harmony, that permit fulfilling the social, economic and other requirements of present and future generations." (U. S. EPA, 2017)

In this project, sustainability is further defined in terms of three common pillars of society: social sustainability, economic sustainability, and environmental sustainability (which includes natural and built environments). These ideas are often thought about in terms of equity.

Social Equity. Social equity can be defined as a society "in which there are no 'exclusionary' or discriminatory practices hindering individuals from participating economically, socially and politically in society" (Dempsey, Bramley, Power, & Brown, 2009). In addition, social equity theory says that two types of social processes are involved. Direct influences are those that directly affect achievement when they are distributed unevenly across racial-ethnic groups. Signal influences are cues members of groups receive that affect achievement and perceptions of self (McKown, 2012).

Economic Equity. Merriam-Webster defines equity as "freedom from bias or favoritism" {#220}. It defines equality as the "quality or state of being equal" {#221}. When we think of economic equity we think, not of all having equal shares of the wealth, but of all having equal opportunities to succeed economically. The Business Dictionary defines economic equity as "the situation in an economy in which the apportionment of

resources or goods among the people is considered fair" ("Economic equity,"). When we consider the disproportionate concentration of wealth in the world today, where ten percent of the population controls ninety percent of the wealth, it does not appear very equitable (Suisse).

Environmental Equity. Environmental equity has been defined as "poison people equally" and environmental justice as "stop poisoning people, period." ("Environmental Justice/Environmental Racism,"). Those who have experienced environmental injustice and inequity understand the unfairness of having a landfill or power plant sited near their homes. It isn't simply people of color who feel the inequity. It is also the poor and powerless in any community. The coal miners of Eastern Kentucky suffer just as much as the people downwind of the powerplant that burns the coal ("Environmental Justice,").

Environmental Diversity and Stability. Environmental justice, however, fails to address the protection of the natural environment, something that will ultimately affect us all. Sustainability requires that we protect the ecosystems upon which all life depends. If we continue to alter ecosystems without regard for long-term consequences, we risk destroying those very systems upon which our lives depend. For example, a farmer may plant a crop that has been treated with a neonicotinoid pesticide to prevent infestations. The chemical is taken up by the plant is in all its tissues. Research has shown a correlation between the presence of neonicotinoid-treated crops and a reduction in the presence of butterflies (Gilburn et al., 2015) and the foraging ability of bees (Mommaerts et al., 2010). Butterflies, bees, beetles, ants, moths, flies and wasps are all insect

pollinators. It is estimated that up 75% of all food crops are dependent upon insect pollinators ("Animal Pollination,"). Should these creatures disappear, the food crops they pollinate will likely disappear with them, likely leaving human beings starving.

OVERVIEW OF RESEARCH TOPICS

Benefits of Teaching Three Elements of Sustainability

With all that a teacher is asked to accomplish in a school day, how can administrators ask teachers to add something else to their plates? Although the idea of teaching for sustainability sounds intimidating, in actual practice, such a classroom does not necessarily look a lot different from a high quality classroom anywhere else.

Student-Centered Learning. Traditionally, a classroom consists of a teacher at the front of the room, lecturing, and students in their seats listening. Such a teacher-centered classroom keeps control of the learning in the hands of the teacher (Estes, 2004) (Pedersen & Liu, 2003). In a student-centered classroom, the power for learning lies with the student. They are typically tasked with answering a question or solving a problem and the teacher is there as a facilitator or co-learner. It becomes less about the teacher teaching and more about students learning. Research (Lee & Hannafin, 2016) (Turner, 2011) has shown student-centered learning to be more effective at engaging students in their learning and helping them to apply their learning across subject areas.

One form of student-centered learning is project-based learning (PBL). A meta-analysis by Allen et al. (Allen, Donham, & Bernhardt, 2011) found that, although PBL did not appear to show a significant positive effect for factual learning, it did show significant improvements in problem-solving, ability to apply learning, understanding of over-arching concepts and student engagement. According to Nolet (2016), this kind of approach promotes critical thinking and effective decision-making.

Meeting Many Objectives. Because sustainability includes the three domains of environment, economics and equity, teaching through a lens of sustainability allows teachers to meet many diverse academic objectives. Sustainability and the environment are usually addressed through biology and environmental science, but are also available for study through such domains as world history, American history and geography. Moreover, economics and equity are deeply intertwined in sustainability studies, as money and government policy affect how and where people live, earn money and invest. Research has shown that students exposed to a robust civic education program, encompassing important societal themes, like those addressed by sustainability (Tilbury 2011), are more likely to be actively engaged as adults (Lin, 2015).

There is much talk in education literature about the importance of making education relevant (Shannon & Bylsma, 2006) (Orthner, Jones-Sanpei, Akos, & Rose, 2013) (Eccles, 1993). Teaching through sustainability demands relevance. Students watch the news and learn about the latest natural disaster or industrial accident and they look to those around them for answers. Sustainability education and student-centered learning work together to empower students to search for their own answers and solutions. Employers want people who are creative thinkers and problem-solvers (Promise, 2007). Teaching sustainability through PBL requires looking at problems and searching for solutions through a lens of the built, natural, and social environment.

For example, according to Nolet (2009), there are nine core themes for sustainability literacy, which facilitate active problem-solving and civic engagement:

- *Stewardship*: Ethical responsibility and connection to the natural world.

- *Respect for Limits*: Live within the reasonable limited resource capacity of our planet (e.g., reduce, reuse, recycle).
- *Systems Thinking and Interdependence* – All things are interconnected.
- *Economic Restructuring*- Change economic assumptions to recognize that natural- and human-made resources are fundamentally different.
- *Social Justice and Fair Distribution*- Ensuring equitable treatment for all members of society is necessary for maintaining social cohesion.
- *Intergenerational Perspective*- We must shift our thinking from short-term gains to long-term sustainability.
- *Nature as Model and Teacher*- Using natural processes to solve problems instead of machines and man-made chemicals is typically safer and fosters biodiversity.
- *Global Citizenship*- Global citizenship refers the importance of seeing the value in all cultures and recognizing one's place as a citizen of the world.
- *Importance of Local Place*- All places should be valued for that which makes them unique.

Core content. Kentucky academic standards clearly state what a student should know at each level of education, from the primary (K-2) and intermediate grades (grades 3-5) through middle and high school in the following areas: English Language Arts (ELA), Mathematics, Practical Living, Science, Social Studies, Visual and Performing Arts, World Languages.

Each area has a set of skills defining what a student should be able to do by a given point in his or her education. For example, the skill of comparing similarities and differences is introduced in kindergarten, further developed in first grade, mastered in second, and applied throughout the remaining years. Checking for consistency of information is introduced in fourth grade, mastered in fifth grade and applied the remaining years. These skills are complemented by standards which are specific to each content area. For example, in cycle 1 (fall), beginning of fifth grade, teachers will teach this standard: *Students will describe specific rights and responsibilities individuals have as citizens of the United States (e.g., voting in national elections) and explain why civic engagement is necessary to preserve a democratic society.* They will revisit it in cycles 3 and 4 (late winter and spring) (JCPS).

If sustainability is thought of as a particular skill set, it is applicable primarily to science and social studies. If it is thought of as an attitude, it is applicable to almost all content areas. For example, practical living, which focuses on diet, physical fitness and social skills, becomes a place for talking about economies and government, the values inherent in using fewer resources, eating healthy, natural foods and seeking stress relief in the natural world. Performing arts and visual arts can be a place where you have discussions around the sustainability-related messages certain plays convey (e.g., environmental and social justice) and how to illustrate them. English language arts can provide an opportunity to synthesize concepts, reading for information or writing to inform, advocate, entertain or persuade. When one is truly sustainability literate, the connections will appear across the curriculum.

METHODOLOGY

Research Design

This qualitative research study was designed to capture a snapshot in time of sustainability programs in place in a large urban school district. We chose to use semi-structured interviews and archival data collection to determine the type and effectiveness of the various initiatives the district has put in place. Prior to beginning this study, I conducted initial interviews with several lower-level administrators to get a general sense of initiatives and priorities. The research reported on here is an attempt to document and expand on those initial findings. Methodology for analyzing the data will be described in the Results section.

The research was done using a mix of semi-structured interviews and collection of archival data. Archival data was collected about concrete data like fuel mileage, distance driven of buses, and energy consumption. We chose to use interviews to collect both quantitative and more qualitative information, and to give the experts an opportunity to discuss topics they felt were relevant (Bernard, 1988). This format allowed for an interview that was both comprehensive and efficient for assessing major elements of sustainability, as well as gaps and barriers in JCPS's current implementation.

Setting and Participants

Jefferson County Public Schools (JCPS) is the largest school system in Kentucky and 27th largest in the nation. There are 172 schools teaching 100,600 students who speak 123 languages (JCPS, 2017d). It is truly a big system with many

stakeholders. In addition, the city is still largely segregated, with most African-Americans living in low-income, majority minority neighborhoods (Poe, 2017).

The participants in the study were primarily high-level administrators selected for their knowledge of many aspects of district operations. When these administrators were unable to answer specific questions, they referred the researcher to specific individuals whom they considered to be experts. Thus, our sample was both a purposive sampling of those believed to have general knowledge about a particular area and snowball sampling (Fraenkel & Wallen, 2006) as we were referred to others who had specific expertise. Such a sampling method can be effective if the respondents are truly experts in the area one wishes to research.

Protostar

There are numerous ways to get a school certified “green.” Most are student-centered and focused on making children aware of problems and helping them develop projects to improve sustainability. We chose to use protostar as the basis for our research because it stands out as being comprehensive and focused on administrative decisions.

The University of Louisville, through which this research is done, is currently using Association for Advancement of Sustainability in Higher Education (AASHE) Sustainability Tracking, Assessment and Rating System (STARS) to track their sustainability. A comparative evaluation of college and university rating systems found STARS to be one of the top two systems available and also the most widely used (Bullock & Wilder, 2016). Protostar is based upon STARS but was developed by the

Eight Schools Association, a consortium of private college preparatory schools. It is comprehensive and designed for use by administrators for assessment and guidance as they strive to make their schools as deeply green as possible.

Up until our research, it had never been applied to an entire school system, certainly not one as large as JCPS. As I dove into its questionnaires, it quickly became apparent it was not designed with public schools in mind. There was no mention of buses and transportation, or professional development for teachers. There was assessment of student housing, affordability and trademark licensing, things that are not relevant to public schools. Protostar thus became a guide that needed considerable additions to accurately reflect the reality of a large urban school district. It is hoped that the administrators of protostar, Green Schools Alliance, will use the information learned as part of this research as they develop further iterations of their assessment system.

Although protostar is a new system with few schools currently using it, I feel it is the best system for evaluating primary and secondary schools. Had I chosen to use STARS, I would have had to make many modifications to their scoring system to adapt it to lower schools. Although I had to make modifications to protostar to meet the needs of a large, urban school district, those modifications will be useful to other districts in the future. In addition, I was specifically asked by staff at protostar for their feedback.

We used the protostar protocol as the basis for interview questions, which were used to learn about JCPS sustainability operations throughout the district. Since protostar is such an extensive evaluation and we had limited time to complete the

research, we focused on the following components. These areas were chosen as being those that were most impactful toward education for, and the practice of, sustainability.

Planning and Administration

- Coordination, Planning, and Governance
 - Sustainability Coordination
 - Sustainability Planning
 - Governance

Operations

- Air and Climate
 - Greenhouse Gas Emissions
 - Indoor Air Quality
- Energy
 - Building Energy Consumption
 - Clean and Renewable Energy
- Purchasing
 - Electronic Purchasing
 - Cleaning Product Purchasing
 - Office Paper Purchasing
 - Inclusive and Local Purchasing
 - Guidelines for Business Partners
- Transportation

- Campus Fleet
- Student Commute Modal Split
- Employee Commute Modal Split
- Support for Sustainable Transportation
- Curriculum
 - Incentives for Developing Courses
 - Campus as a Living Laboratory

Administration and planning. Addressing sustainability in Administration and Planning is important. Decisions made at the administrative level affect all levels of operations within any organization.

Energy. Energy can sometimes be considered the low-hanging fruit of sustainability. As renovations are made to buildings, more efficient systems can be installed. They are also considerations when investing in renewable energy. Although such systems may initially be more expensive, they often pay for themselves over time. This return-on-investment (ROI) (2017) is often the determining factor as to whether a more sustainable purchase is made. These decisions are affected by things beyond immediate cost, such as tax incentives and rebates from utilities as well as the cost of energy in the area. For example, the local utility offers rebates when a business or individual replaces an inefficient HVAC system with one that meets Energy Star standards (LG&E, 2017). In addition, the federal government gives tax refunds up to 30% of the purchase price for Energy Star-rated products. One must also consider the

local cost of electricity, which varies from 7.4 cents per kilowatt hour in Washington state up to 26.17 cents per kilowatt hour in Hawaii (EIA, 2017). These factors must all be taken into account when deciding on a purchase.

Other ways of conserving energy are considered during renovations. Often single pane windows are replaced with double pane, or even triple pane windows. Insulation can be added to walls and ceilings. Weather-stripping can be added around doors and windows (2017a). These will all increase energy efficiency, but the ROI calculations must be made to determine whether they are worth it over time. Additional, less expensive changes can be made outside buildings that may pay off in future years, such as planting trees that may one day shade a building (2017b), reducing cooling costs.

These are all useful ways of reducing fossil fuel use but their adoption is largely dependent upon factors outside an organization's control. Energy efficiency needs to be a priority for sustainability but it is often outweighed by more immediate financial considerations.

Transportation. Transportation can be a big expense for a school district. Between the cost of the buses themselves, fuel and maintenance, transportation can eat up a significant proportion of a district's budget. Thus, it is important to do everything possible to keep those costs down. There are currently more school buses operating in the United States than all other forms of mass transit combined (Cox, 2014)

As with Energy, efficiencies in transportation are usually gained through fuel savings. Fuel is saved primarily through the purchase of efficient vehicles and

development of efficient routes. Savings can also be had through a reduction in ridership, but that is likely offset by an increase in private vehicle use.

There are many variables involved in route planning, especially in a district that emphasizes school choice and diversity, and complex computer programs are used to design routes. The main factors considered when designing routes are home and school addresses and age. One must also take into account whether the buses will carry single loads (all students go to the same school) or mixed loads (students go to a number of different schools). Research has shown that mixed loads are more efficient (Spada, Bierlaire, & Lielbling, 2005), requiring fewer buses. Efficiency may also be improved by switching to alternative engine or fuel types, such as hybrid gasoline-electric or CNG (compressed natural gas) engines, but such vehicles have their own issues. They can be considerably more expensive to purchase and maintain (Hovey-Brown), negating any cost savings.

Purchasing. A public school district's purchasing habits can make a sizable dent in its carbon footprint, whether it is through the purchase of copy paper or light bulbs. However, care must be taken in using public money for greener, more expensive options without financial justification. All public agencies must follow the Model Procurement Code (ABA, 2017), written by the American Bar Association and adopted into state law around the nation. Among other things, it sets clear policies for contract award procedures such as competitive sealed bidding, competitive sealed proposals, small purchase procedures and sole source procurement. Within these guidelines, districts are able to set policy regarding purchases. For example, they can mandate that all copy

paper have a certain percentage recycled content and that all new lighting fixtures be LED compatible. They can also require that purchases be made from small local firms and that products be sourced from within a specific geographical area, such as a 100-mile radius. Besides making all these decisions to purchase locally and sustainably, an organization can also mandate that suppliers and vendors follow the same guidelines by requiring a Vendor Code of Conduct.

Interviews

We obtained permission to conduct our research from the Institutional Review Boards of the University of Louisville and Jefferson County Public Schools. We used the Protostar framework to design semi-structured interviews to learn where JCPS stands on each of the dimensions identified above. We chose to conduct interviews to glean qualitative information, such as barriers to improvement, that would not likely be reflected in numerical data. Where specific information, such as number of miles school buses drive each year, was requested, it was collected outside of the actual interviews

Interviews were conducted primarily with upper level administrators. As such, we interviewed the Chief Operations Officer to learn whether the district has a sustainability plan or a sustainability coordinator and what barriers might be in the way of establishing such programs. The Energy Auditor was asked about energy consumption throughout the district and what strategies are in place to reduce energy use. The Director of Curriculum and Community Engagement was asked about the availability of classes that focus on sustainability or have it embedded in the curriculum, and about professional development for faculty and staff. The Director of Transportation Services was

interviewed to learn about strategies to reduce emissions from buses and to reduce the total number of miles driven. When upper-level administrators weren't able to answer our questions, we went to people they recommended as area experts. Thus, we interviewed the Sustainability Coordinator to learn about Air Quality and a District resource teacher and founding member of JCPS Forward, a teacher-led professional collaborative group for supporting the development of innovative and effective teachers across the district, to learn about innovative teachers and what professional development needs teachers have been interested in.

We chose to approach this as qualitative research because we wanted to do an in-depth study of an organization to determine not only what they are doing, but why. An easy way to determine why someone does something is to simply ask. Thus, we chose to use interviews. Informal or unstructured interviews did not seem the most appropriate because we wanted to collect very specific information, often from upper-level administrators who may not be available for follow-up questions. We believe the best format to be semistructured interviews. This would allow the researcher to be sure to collect the desired information, but also allow the flexibility to follow interesting conversational threads.

An important set of questions used in every interview revolved around the barriers to change. We were especially concerned about what types of barriers (e.g. institutional, governmental, financial, etc.) might be slowing or stopping progress in any area. For example, are there state regulations in place that prevent the district from purchasing more environmentally sustainable cleaning products if they cost more than

conventional cleaning supplies or are there specific employee groups that might protest a change in policy regarding personal refrigerators or space heaters?

Below are sample questions from each interview (see Appendices A-G for the full interview documents).

Planning and Administration. Planning and Administration addresses whether the district has a sustainability plan in place and what infrastructure exists to support its implementation. This information is important, because a sustainability plan is the guiding document that includes not just a destination (sustainability) but a roadmap indicating the objectives for getting there. The presence of a sustainability plan is a strong indicator of an organization's commitment to sustainability.

Sustainability plan. Does JCPS currently have an overall sustainability plan, or other guiding vision, for the district that focuses on sustainability goals? Does the plan include the ***environmental dimensions*** of sustainability as a priority? Does the plan include the ***social dimensions*** of sustainability as a priority? Does the plan include the ***economic dimensions*** of sustainability as a priority?

District Sustainability Committee. Does JCPS have a sustainability committee that focuses on sustainability broadly and covers the entire district?

Individual School Committees. Are there any sustainability committees at individual schools within JCPS, and if so, do any of their activities stand out as particularly noteworthy?

Air and climate. This section seeks to determine the presence and scope of a greenhouse gas emissions inventory. Such information is important as a baseline to measure progress against. It is also useful to determine areas of focus. Where are the organization's emissions especially high and where should they focus their efforts?

Inventory Has JCPS done a greenhouse gas emissions inventory in the past three years? **Future Plans?** Has JCPS considered conducting a Greenhouse Gas Emissions Inventory? **Barriers?** What barriers, if any, do you anticipate with regard to completing a Greenhouse Gas Inventory?

Space covered. What percentage of building space is covered by an indoor air quality plan? Does this include regular monitoring and a mechanism for reporting concerns? Are there some areas that are more difficult to maintain than others? Why?

Energy. In this section, we sought to learn whether the district has a plan to reduce energy use and what steps are in place to accomplish it. Just as with the sustainability plan, the presence of a plan indicates an organization's level of commitment to reducing fossil fuel use and energy consumption in general.

Energy conservation plan. Does JCPS have an overall energy conservation plan, or other guiding vision, for the district that focuses on energy and sustainability goals? **Significant Milestones?** Has JCPS reached any significant sustainability goals from the plan in the past few to several years?

Energy use (total). I am trying to get a sense of JCPS's overall energy use. What was the typical (average) building energy consumption (in MMBtu) for all JCPS

buildings in the past 3 years? What was the typical (average) building energy consumption (in MMBtu) for all JCPS buildings in the past 3 years?

Management system. How does JCPS monitor its energy use for the entire district? Does JCPS use a centralized energy management system, which allows it to track energy consumption and performance of multiple buildings from a central location, or software? **Sources?** What energy sources does JCPS use to get its energy for buildings and facilities? This includes public sources, like powerplants, and your own private sources, like incinerators.

District-wide Technologies. How does JCPS manage the use of energy saving technologies: does JCPS require or encourage the use of particular technologies as a standard policy? Or are these kinds of decisions left up to particular building managers on a case-by-case basis?

Purchasing. We also wanted to know what policies exist to encourage purchase of environmentally friendly products and services. Such policies ensure sustainability is considered when making purchasing decisions.

Policy. Does JCPS have a stated policy for purchasing cleaning products that are Green Seal or Eco Logo certified, or perhaps some other Green designation? What steps are in place to ensure the policy is followed? Does JCPS have a vendor code of conduct that sets expectations for all agents (contractors, equipment suppliers, food vendors etc.) about the social and environmental responsibilities of vendors with whom the district does business?

Policy for office paper and other classroom uses. Does JCPS have a policy for purchasing office paper and paper for other classroom uses with recycled content? Briefly, what are the main goals and aspects of the policy? What steps are in place to ensure the policy is followed?

Percentage of expenditures. About how much (what percentage) of the office and classroom paper purchased in the last three years (or most recent year) meet the policy's standards? Overall, about what percentage of paper use adheres to the policy?

Transportation. When the average person thinks about fossil fuels, they probably picture a car or truck driving down the road. We have been taught to see reducing auto emissions as an important step in fighting climate change. JCPS is a big district with lots of buses moving students all over town to maintain diversity. We wanted to know how far they drive and what they are doing to minimize miles driven and overall emissions.

School Bus Fleet. How many buses are in the district fleet? How many of those are hybrid gas/electric? What hybrid system is used? How many miles do school buses travel each year (3 year average)? How many gallons of fuel were used in the buses, on average, each year (past 3 years)? How many miles are put on these buses before they are retired?

Engine Comparisons. How does fuel mileage vary among the different types of engines? Given fuel mileage and maintenance needs, which style of engine do you find preferable and why?

Number of Students. How many students were transported to school on district buses each day, on average (past 3 years)?

Bus passes. Does JCPS offer free or reduced-price transit passes for students or employees?

Future Plans. What plans, if any, has JCPS considered to reduce greenhouse gas emissions in relation to staff and student commuting?

Curriculum. A school's primary mission is to prepare future citizens. We wanted to know how they are preparing teachers and students to be sustainability-literate. All the energy efficiency and recycled paper in the world isn't going to be enough if the organization fails at its primary job.

Incentives. What kinds of incentives or programs, if any, does JCPS have to encourage educators to integrate sustainability into already existing courses, or develop new sustainability related courses?

Learning Communities. Are there any Professional Learning Communities within JCPS that educators can participate in to learn more about sustainability and environmental education?

Partnerships. Does JCPS have formal partnerships with other, non-academic, organizations in the city to advance sustainability?

Collaboration. Does JCPS work with other schools or school districts in the region to advance sustainability? If so, what are the general goals of such collaborations?

Archival Research

JCPS maintains extensive data on energy use, miles driven, fuel consumed and numerous other data sources. The following archival data was in each of these areas:

Planning and Administration

1. Charter/mission statement for JCPS's district-wide Sustainability Committee
2. Names, roles or job titles (e.g., staff, faculty, student) and affiliations (e.g., school) within the district of the members of the committee?
3. Number of sustainability committees at individual schools within JCPS
4. Job description for the JCPS Sustainability Coordinator
5. JCPS's Sustainability Plan
6. JCPS's Physical Campus Plan
7. JCPS's Climate Action Plan

Transportation

Total number of vehicles in the fleet, including all of those below: Gasoline-hybrid, non-plug-in hybrid, vehicles, Diesel-electric, non-plug-in hybrid vehicles, Plug-in hybrid vehicles, 100% electric vehicles, Vehicles fueled with 100% compressed natural gas, Hydrogen-fueled vehicles, Vehicles that are fueled with B20 or higher biofuel for more than 6 months of the year, Vehicles that are fueled with E85 or higher ethanol for more than 6 months of the year, Total number of vehicles overall

Purchasing

1. A copy of the district's policy regarding the publishing of catalogs, course schedules and directories on-line instead of on paper
2. A copy of the district policy regarding the use of recycled content napkins, toilet paper and paper towels
3. A copy of the policy JCPS uses to determine which computers and other electronic devices to buy
4. A copy of the District's policy on the purchase of copy paper

Air and Climate

1. JCPS's No Idle Policy
2. JCPS's Greenhouse Gas Emissions Inventory and any Updates
3. Indoor Air Quality Plan

Energy

1. Percentage of district buildings (in square feet) monitored with an energy management system
2. Name or description of the District's centralized energy management system
3. Total building energy consumption (in MMBtu) for all JCPS buildings last year (most recent data available)
4. Percentage of total energy needs provided from renewable sources
5. Number of buildings with lighting sensors

Curriculum

1. Total number of schools with active student groups focused on sustainability or environmental education
2. Number of professional development opportunities for teachers to develop proficiency in the teaching of sustainability or environmental education, teaching with social justice or economic justice in mind
3. The number of professional learning communities or other groups that focus on any of the three areas of sustainability (environment, social justice or economics) and the schools involved in each group.

Procedures

The original participants in this study were selected for their general expertise in district operations and were initially contacted by the office of the Chief Operations Officer. After initial contact, the author followed with emails or phone calls to schedule interviews. Once each respondent agreed to be interviewed they were then forwarded the actual interview questions and informed consent, as well as the request for archival data. Initially, we had not planned to provide the interview questions ahead of time, but after having multiple respondents request them, we just made it a standard practice. It was not likely to affect the actual responses and made the interviews flow more smoothly.

As required by the Institutional Review Boards, all participants were required to complete an Informed Consent detailing the purpose and procedures of the study as well

as its potential risks and benefits. They were also informed of their right to refuse to participate in the study, answer any specific questions or complete the interview. They also indicated their agreement or refusal to be recorded. Upon completion of the Informed Consent, the recorder was started (if allowed) and the interview conducted. Participants were asked prepared questions and follow-up questions as needed. Each interview lasted approximately forty-five minutes and, upon completion, the respondents were asked if they had anything else they wished to add. If not, they were thanked for their time and the researcher departed.

RESULTS

Results were collected in the areas of Planning and Administration, Energy, Air and Climate, Purchasing, Transportation, and Curriculum, Professional Development and Community Engagement. We wanted to know what the district was doing to enhance sustainability in each of these areas. To understand our findings, we evaluated each activity listed in the protostars rating system, using the more objective scores provided by protostars. We also, subjectively evaluated each activity to provide scores from absent to excellent, which JCPS administrators may find useful for communicating our findings and for guiding their decisions.

Analysis. Based on protostars, and our experience working as an educator in the JCPS system, we came into this research with some specific expectations and research questions, as outlined above. However, to ensure that we accurately captured JCPS's current activities, we applied the protostars assessment in a flexible way (e.g., semi-structured interviews and on-site observations), so that our research questions and data collection could be adjusted throughout the data collection process, as needed. This combination of a-priori research questions and objective measures, with more flexible qualitative and adaptive observations allowed for a comprehensive evaluation.

Objective Ratings (protostar). Objective ratings were calculated using the scoring system from protostar. For example, four points are available for the presence of an energy management system, which the district has, so four points were given. Some items, however, had to be adapted, such as renewable energy. Data was not available

to calculate the percentage of energy generated from renewable sources. It is a significant financial investment in a district this large and there are multiple projects, generating both electricity and hot water. Although they do not make a big impact overall, they are steps in that direction and should be recognized as such.

As previously mentioned, protostar is still in development, so there are some gaps in its assessment coverage. For example, protostar does not include any data about bus ridership, which is highly relevant to public school systems and is likely to have a large environmental impact. To determine objective weights for these kinds of entries, we used the weights protostar has given other criteria in the overall category. For example, they give a value of two for alternative fueled vehicles, the highest point value item in Transportation. Given the impact of students arriving at school in private vehicles compared to school buses, bus ridership was given a weight of four.

Subjective Ratings. Many of the protostar criteria simply awarded full points if a particular activity or technical equipment was present. However, activities and equipment for sustainability differ greatly in their quality, implementation, and effectiveness, and this is important to consider. For example, it may not be sufficient to simply have a greenhouse gas emissions inventory, if it is missing important information, implemented poorly, or is outdated. In addition, particular activities or equipment may be exceptional. Subjective ratings allow these kinds of elements (strengths and weaknesses) to be captured. Subjective ratings were determined using a scale of 0 to 4, where 0 indicates that characteristic is non-existent; 1 (poor) means it exists but needs considerable improvements; 2 (fair) means it is robust enough to have an impact but

needs some improvements; 3 (good) means it needs very few changes; and 4 (excellent) means it would be difficult to improve upon.

Overall Scores. We also computed an overall score for each major category of the protostars assessment, to be used as an overall guide for decision makers. To calculate the overall objective scores, we used protostar's ratings as a model. Protostar assigns Platinum, Gold, Silver or Bronze according to the overall percentage of points an institution earns from all its objective ratings. Only categories that are relevant to a particular school are used in such a calculation. For example, all schools produce greenhouse gas emissions, so all schools tend to include points in that category. However, some schools do not have student housing, so those schools do not include points for that category in their calculations. A percentage score is assigned in each area (number of points earned divided by number of points available). An overall score was obtained by dividing the total number of points earned by the total number of points possible. Schools are assigned Platinum (85% or above); Gold (65-84%), Silver (45-64%), or Bronze (25-44%) according to the final percentage score.

In order to calculate the overall subjective score, we added all the subjective scores in a particular category together and divided by the total number of possible points to get an average. Scores for all items were included in the calculation, although some items worth one quarter or one half point, when non-existent, could significantly pull down an otherwise high score.

Planning and Administration

The results from the Planning and Administration interviews focused on activities identified by protostar that indicate a focus at upper levels of administration on sustainability throughout the district. This includes the presence of a district-level sustainability committee as well as at the level of individual schools. We also wanted to know whether JCPS had developed a district level sustainability plan and greenhouse gas inventory and whether there are employees whose job description focuses on sustainability, We interviewed the Director of Operations Services, who oversees maintenance and building operations throughout the district.

Table 1. Planning and Administration

Planning and Administration	Weight	Score	Rating	Additional Comments
District-wide Sustainability Committee or Sustainability Coordinator or Office of Sustainability	3	0	0	
Diverse representation throughout district	1	0	1	When the Partnership for a Green City developed their sustainability plan, JCPS was represented by 2-3 people from administration. No students from any institutions were included
Sustainability Committees at Individual Schools	2	0	1	No centralized tracking of such committees
Sustainability Plan	3	3	2	Uses outside plan (Partnership for a Green City)
Physical Campus Plan	4	4	2	
Climate Action Plan	2	2	1	Uses Strategic Plan of Partnership for a Green City which has little directly addressing education

0= non-existent, 1=poor, 2=fair, 3=good, 4=excellent

Planning and The Strategic Plan. For the purposes of our research, a strategic plan is defined as “the premier guiding document for an institution. It shapes the institution’s priorities and guides budgeting and policy making. Including sustainability at

a high level in the plan indicates signals an institution's commitment to sustainability and may help infuse an ethic of environmental responsibility throughout the institution.”

(Association, 2013) Strategic plans are common throughout the business world and although they may not have met the goals set out in the plan, it is a roadmap indicating where the organization plans to go.

When the author interviewed a variety of people and asked about policies regarding various aspects of school board management, the answer was often, “We follow Partnership guidelines.” Thus, JCPS has no independent Strategic Plan. They follow the Strategic Plan of the Partnership for a Green City, which was adopted in 2009 and revised in 2015 (PGC, 2014). For example, they buy 30% recycled content paper because that is what the partnership agreed upon. They buy cleaning supplies with the Green Seal or Eco logo, which is what the partnership recommends.

JCPS, along with Louisville Metro and the University of Louisville, formed the Partnership for a Green City in 2004 as a collaborative effort to expand environmental education, examine operational practices to improve sustainability, and develop joint sustainability goals and policies. What began as a collaboration for improving the sustainability among the three largest governmental entities in the city has grown into an organization that now includes Jefferson Community and Technical College, the Louisville Water Company, the Metropolitan Sewer District, the Louisville Regional Airport Authority and the Transit Authority of River City (TARC) (PGC). According to the director of the Partnership, besides giving its members a forum to develop plans and

shared goals, a major benefit of membership is that they are using their combined buying power to purchase environmentally sustainable products at lower prices.

Prior to development of the strategic plan, a full greenhouse gas inventory of all partner organization emissions was completed in 2009 (PGC, 2009). The plan was originally developed by members of the Partnership's Steering Committee, who then invited leaders of the other teams to provide input. The Director of Curriculum and Engagement is a member of the Steering Committee and district environmental educators were consulted as well.

The plan, as adopted by JCPS and the other partners, directly addresses the three E's of sustainability: economics, equity and the environment. Current teams include: Behavior Change for Sustainability, Climate Instability (deals with issues surrounding resilience and adaptation), Green Buildings, Green Transportation, Green Purchasing, Total Materials Management (deals with waste reduction) and Urban Heat Island. One of the themes of the partnership's strategic plan is education, yet, at this time there is no action team to address education. At one time, there was an Outreach and Education team, but it has been disbanded.

A five-year review of the Strategic Plan was published in 2014 and the director of the Partnership indicated another should be done soon since they "have met most of (their) goals already."

A close look at the most recent Climate Action Report does not reveal any measurable outcomes specific to JCPS, although such measures are specified for the university (AASHE STARS) and the city (STAR community). Given that protostar, upon

which this case study is based, was not yet available to the public when the research began, it is likely that no comprehensive system was in place to quantitatively measure progress in sustainability for JCPS.

JCPS places a high priority on energy efficiency. They have been measuring energy consumption since 1979 and have had an energy auditor since 1983, and the number of Energy Star-rated schools increases steadily with each renovation. There are currently 45 schools with scores in the 75th percentile or above, meaning 31% percent of all schools in the district are eligible for Energy Star certification (Star) .

The district's newest building, Norton Commons Elementary, was built to LEED-like standards, with concrete-structural insulated panels (C-SIP), polished concrete floors instead of tile for lower maintenance, motion sensors in each room for lighting, and geothermal heating and cooling. The school's gymnasium was partially funded through an agreement with the adjacent YMCA. The school has priority use of the gym during the school day and for special events, but after school hours it is open for public use. The YMCA also maintains the ball fields, which are also available for school use during the day. It was described as a model for new buildings that may one day replace the district's aging building stock (Ross, 2016).

Single-stream recycling is available in all buildings throughout JCPS, but its use varies considerably. Data for elementary schools for the 2015-2016 school year show schools with recycling rates as high as ninety-four pounds per student per year and as low as fifteen pounds per student per year. There is currently a pilot project in place at one school to sort cafeteria waste for recycling and composting. That school is also

collecting leftover food for redistribution to homeless shelters, something they would like to see done more often, but is limited by cost.

In 2016, the district began a new practice aimed at reducing greenhouse gas emissions by grounds maintenance crews. Areas have been declared mow, slow mow or no mow. Mow zones are maintained on a regular schedule, slow mow zones are cut every other time and no mow zones, clearly posted with signs designating Urban Reforestation, are no longer cut at all. There has been opposition to this policy from the public and members of the administration who want entire properties maintained with short grass. Louisville Metro is located in the Ohio River Valley and has frequent air pollution alerts. It is now city policy to cease mowing on days when the ozone level exceeds safe standards. JCPS's policy to reduce mowing helps to support that.

Physical Campus Plan. JCPS's focus on sustainability is largely evident in building construction and maintenance. Renovations are done with an eye toward Energy Star certification. When HVAC and hot water systems are replaced, they are replaced with products with Energy Star ratings. These products have been shown to give a significant return on investment over the lifetime of the system and qualify for rebates from the local public utility.

It was noted that particularly large boilers consume over ten million btu's per hour. These are especially inefficient and are required to be registered with the local air pollution control district and pay a \$760 permit fee annually as a registered emissions source. A priority has been put on replacing these systems and the savings have been significant. One high school had four boilers that consumed a total of 13.6 mm btu's per

hour. They were replaced with one that uses less than ten million btu's. At another school, a boiler that drew 12.6 mm btu's was replaced with one that pulls three million btu's.

A new elementary school recently opened that was built to LEED-like standards. When asked why it wasn't built full LEED, it was explained that the interviewee had been in a building in his previous district that, in a search for "points", had done things like install bike racks where none were obviously needed.

Office of Sustainability & Sustainability Coordinator. When asked whether the district has a Sustainability Coordinator, or equivalent office, the researcher was referred to two individuals in the Safety and Climate office who oversee some of the initiatives in addition to their regular duties. Additional questioning revealed the office of Environmental Coordinator.

The Environmental Coordinator is a member of the office of Safety and Climate. His main duties involve indoor air quality and mold mitigation. His personal passion is getting JCPS to Zero Waste through composting and enhanced recycling. He describes his job as 30% indoor air quality, 20% environmental coordination and 50% other activities. It appears to be largely a "passion project" for him and could easily fall by the wayside were he to leave. Given his other duties in addition to Environmental Coordinator, it appears the district does not place a high priority on the sustainability aspect. This is in contrast to the emphasis placed in New Employee Orientation on waste reduction and recycling, where fully half the time is spent on sustainability issues.

Summary

JCPS participated in a full greenhouse gas emissions inventory in 2009 and uses the strategic plan of the Partnership for a Green City as their guiding document for sustainability. They currently have an environmental coordinator who focuses on recycling and a significant number of Energy Star-Certified schools. All new buildings are built to LEED-like standards and all renovations are designed for maximum energy efficiency.

JCPS has done a lot to improve sustainability in district operations but does not have an office or employee dedicated to sustainability on a full-time basis, nor do they have a dedicated strategic sustainability plan. These are significant shortcomings that are largely believed to be a result of inadequate funding.

JCPS does not currently have its own Sustainability plan. They rely on the Strategic Plan of the Partnership for a Green City, which does not put a high emphasis on education.

There is a Sustainability Coordinator, but his main duties actually involve air quality and mold mitigation. The district places a high priority on energy efficiency and 31% of its buildings qualify for Energy Star certification. Single-stream recycling is available across all buildings in the district and efforts are made to minimize mowing and its attendant CO₂ emissions and renovations of buildings across the district are done to the highest efficiency standard feasible.

Energy

The interview probes in Energy focused on the district's efforts to reduce greenhouse gas emissions, whether that was through energy efficiency or development of renewable energy. We wanted to know whether there was an explicit plan for energy sustainability as well as what projects had been implemented. We interviewed the energy auditor, an administrator whose sole job is to monitor energy use throughout the district and to research ways to improve efficiency.

Table 2 Results- Energy

Energy	Weight	Score	Rating	Additional Comments
District-wide Energy Management System	4	4	4	
Energy Metering on all Buildings	2	2	4	
Renewable Energy	7	4	2	Several demonstration projects
Timers for Temperature Control	2	2	4	
Lighting Sensors	0.25	0.25	2	Being installed as part of renovations
LED Lighting	0.25	0.25	2	Being installed as part of renovations

Rating: 0= non-existent, 1=poor, 2=fair, 3=good, 4=excellent

With over one hundred forty schools, one thousand two hundred eighteen buses and numerous maintenance and administration buildings, JCPS burns a lot of fossil fuels. When the District's Greenhouse Gas Emissions Inventory was completed in 2009, it was found that the district emitted a total of 248,707 tons of CO2 equivalent gases.

Building stock. Most of these emissions (218,297 tons) are from buildings that range in age from 1896 to 2016. Spending over fifty million dollars per year on renovations, the district has tried to regularly upgrade buildings for energy efficiency, with particular emphasis on HVAC systems and window replacement. Many of the

schools were built in the 1950s and 1960s to accommodate the baby boom and have been through multiple upgrades in the following decades. The HVAC systems were first replaced in the 1980s and are reaching the end of their useful lives. Where once a school was heated with two boilers approximately fifteen feet long and operating at 80% efficiency, they are now being heated by two boilers approximately the size of refrigerators that work at 96% efficiency. With the addition of new windows, occupancy sensors for lighting and other updates, energy consumption has steadily decreased. Of one hundred forty school buildings, forty-seven have Energy Star ratings of seventy-five or above and fourteen rank in the 90th percentile nationwide.

A deeper dive into the Energy Star scores shows an interesting discrepancy in efficiency. Of the seven schools built since 1995, only one has a score greater than seventy-five. Two of the seven have scores among the worst in the district. Contrast these with the high scorers. All of those buildings were built between 1954 and 1973 and were renovated between 2004 and 2013.

Why is a building built in 1954 and renovated in 2004 scoring higher than one built new in 2007?

Without an in-depth study of each individual building, it's difficult to know, but building operations are a likely source of energy waste. The author's experiences in one of those schools is illustrative. Indian Trail Elementary was built in 1959 and there are eighteen schools in the district with almost identical layouts. The building is a single-story L-shape, with the front entrance in the corner of the L and primary and intermediate wings branching off. Every classroom has two doors, one to the hall and another

outside. The exterior wall of each classroom has large metal-framed, single pane windows with pull-down shades. In our building, the intermediate wing has windows oriented east-west and the primary wing windows face north-south. When the sun comes up in the morning, the classrooms on the east side are blasted with bright sun. The west side gets it in the afternoon. The south-facing side of the primary hall gets bright sun all day, year round. The north side is perpetually in the shade. The HVAC system was last updated in the 1980s and the vents that provide air circulation are located under these windows. This can make for vast differences in HVAC and lighting use. Add to that the convenience of exterior doors. At recess time, it was not uncommon to see doors propped wide open in ninety-degree weather so students could run inside to use the restroom. The principal finally stopped that behavior by citing security concerns and threatening to “write up” any teachers still seen to be doing it.

Each classroom also has a SmartBoard and ceiling mounted projector. The bulbs for the projectors cost approximately four hundred dollars each, but it isn't unusual to see projectors on in unoccupied classrooms. About half of those rooms also have a mini fridge tucked away in the corner, holding bottled water and maybe the day's lunch. Despite being less than a quarter of the size of a standard refrigerator, some older mini fridges use more electricity than a full-size refrigerator (CR, 2013). Each classroom also has four or more computers, most of which are left on all the time, including weekends and vacations. There are eighteen schools in the district with the exact same floor plan, and the same issues.

There has been much education, from principals and from the district, reminding teachers to conserve energy by turning off lights when they leave the room and computers at the end of the day, but the behaviors persist. It was mentioned in one interview that the district is afraid to ban refrigerators and coffee makers from classrooms for fear of upsetting the teacher's union. Teachers are only allowed twenty minutes for lunch and it is more time efficient to keep your lunch in your room.

There is a body of evidence that indicates education alone is not effective at behavior change (Malone et al., 2013). A number of psychological principles need to come into play, and even then behavior change can be very difficult to achieve (McKenzie-Mohr, 2013) (Steg & Vlek, 2009).

Energy Tracking. JCPS has had an Energy Auditor since 1983 and has been tracking energy use since 1979. They use Portfolio Manager from Energy Star to track consumption. All buildings have individual meters for electric and gas and are measured separately. With continuous monitoring of energy consumption, the auditor can spot spikes in consumption that may signal malfunctioning equipment and when equipment exceeds its useful life, it is replaced with equipment that meets energy efficiency requirements for rebates from Louisville Gas and Electric (LG&E). The decision to replace aging equipment is determined by Return on Investment (ROI), how much money will the district save in efficiency and how quickly they will be able to recoup the costs of replacement.

Energy Sources. Except for a few demonstration projects, JCPS gets all its energy from LG&E. Kentucky is historically a coal-producing region and until recently,

most of its energy was produced through the burning of coal. Although expensive in terms of climate impact, coal has always been financially inexpensive. According to the U.S. Energy Information Administration, the national average price for electricity is 10.41 cents per kilowatt hour. The average price in Kentucky is 8.14 cents (EIA, 2017). With prices that low has been difficult to justify investment in alternative energy.

Administrators in JCPS support the development of renewable energy across the district and have several demonstration projects in place but they have not been found to be cost-effective. The exception is geothermal refrigeration, which has been found to be cost-effective in certain situations.

Energy Conserving Technologies. The district has several demonstration projects at various facilities. Four schools have solar hot water, three buildings have Solar tubes, which bring concentrated daylight into interior rooms, and nine cafeterias across the district have geothermal refrigeration systems, with four more scheduled to be added in 2017. Although geothermal HVAC has been piloted at two buildings and is included in new construction, it has not been found to be financially feasible as part of a renovation.

JCPS, as a member of the Partnership for a Green City, has also been exploring the use of lighter-colored roofing materials. One high school has a portion of its roof painted with white titanium paint to test for temperature difference when compared with conventional roofing. At least seven buildings have metal roofs. Many of these were installed more than fifteen years ago and had the paint peel off. After many years trying

to pursue a claim with the manufacturer, the district began replacing them three years ago. At that time, they also added insulation. There are no vegetated roofs.

JCPS has adopted a number of strategies for energy management over the years. The HVAC systems at all schools are managed remotely. The buildings are maintained at one temperature during the school day and another temperature is maintained during non-school hours. Although this is a good strategy for reducing energy use, in the hot and humid climate of Kentucky it can have unintended consequences. The custodial staff may clean a room shortly after school lets out for the summer and then not enter it again till teachers come back in August. During that time, the heat and humidity combine to allow mold to grow.

Within the past year, the district adopted guidelines for LED lighting and began installing it as part of renovations both large and small. Prior to that, most buildings had been fitted with high-efficiency fluorescents, and light switches throughout the district are gradually being replaced with motion-sensors.

Four schools have solar hot water, three buildings have Solar tubes, which bring concentrated daylight into interior rooms, and two have photovoltaic solar panels or wind turbines. Although building-wide geothermal HVAC has been piloted at two buildings and is included in new construction, it has not been found to be financially feasible as part of a renovation.

At one school, students determined the optimal color for a cool roof and secured funding through a grant to have it installed on part of their school. They are monitoring the temperature difference as part of on-going research into the urban heat island effect.

Summary. JCPS has done a lot over many years to improve energy efficiency, particularly in a region with low energy prices. They have been tracking energy use for almost forty years and aim to improve energy efficiency with every renovation, large or small. Pilot projects are undertaken to explore the feasibility of new technologies and the technologies are adopted as they are found to be financially feasible.

The only area that seems to be entirely neglected in improving energy efficiency is use of alternative roofing materials. Some flat asphalt roofs have been replaced with metal gable roofs and there is a pilot project testing titanium paint on a flat roof. Otherwise, the remaining buildings all seem to have flat asphalt roofs.

There are two significant barriers to increased energy efficiency: low electricity prices and human behavior. With energy prices in the region well-below the national average, it isn't cost effective to install solar photovoltaic panels, geothermal or some other technologies. In addition, it is difficult to change human behaviors and this is evident with efforts to adopt energy efficient behaviors. Old habits die hard.

Jefferson County Schools have many buildings built prior to 1970. It is estimated that they spend fifty million dollars a year on renovations that include increasing energy efficiency. As a result, many of those buildings meet Energy Star Standards for energy efficiency. Installation of high efficiency equipment only goes so far though when the people occupying the buildings persist in wasteful behaviors, which could be addressed with better interventions on the administration and planning side of management. The district has been tracking energy use for many years and is able to use real-time energy monitoring to spot malfunctioning equipment. They do not currently use any significant

amount of renewable energy, although there are several small-scale installations. They have installed geothermal at several locations and have found it to be most cost-effective for refrigeration in cafeterias.

Air and Climate

Air quality is important for the health of students and staff. Presence of mold, cockroaches, cleaning chemicals or vehicle exhaust can trigger asthma attacks in vulnerable students (EPA). Mold can be an ongoing problem, particularly in older buildings. Regular maintenance procedures can reduce the presence of many asthma triggers.

The protostar assessment asks about the presence of a Greenhouse Gas Inventory, including whether it accounted for emissions from all sources, both moving and stationary. It also asks about an Indoor Air Quality Plan, important for addressing indoor air quality issues. Local offsets and air travel emissions policies are designed to mitigate greenhouse gas emissions. Information in this area was collected from the Environmental Coordinator.

Table 3 Results-Air and Climate

Air and Climate	Weight	Score	Rating	Comments
Greenhouse Gas Emissions Inventory	2	2	3	Originally conducted in 2009, updated in 2014
Indoor Air Quality Plan	1	1	3	
Local Offsets Policy	.50	0	0	
Air Travel Emissions Reduction Policy	0.25	0	0	

Rating: 0= non-existent, 1=poor, 2=fair, 3=good, 4=excellent

Greenhouse gas emissions inventory. JCPS conducted an initial greenhouse gas emissions inventory in 2009 as part of the Partnership for a Green City. The results showed that the largest area by far was buildings at 88%, followed by waste at 11%, and vehicle fleet at 1.7%, with total emissions of 248,707 tons CO₂ equivalent. The inventory included all scope 1 and scope 2 emissions. Scope 1 emissions are those generated by entities owned or directly controlled by organization, such as vehicle emissions. Scope 2 emissions are those generated as a result of energy purchased from outside sources (Boles). In the case of JCPS, this is emissions from both gas and electricity generation. It does not account for emissions incidental to air travel, commuting, manufacture and shipping of supplies, transport of food or solid waste, or emissions from students who travel by private vehicle.

Indoor air quality plan. JCPS has an Indoor Air Quality Plan that includes regularly changing filters in classrooms HVAC units and checking regularly for mold, radon testing and mitigation, and integrated pest management. A system is also in place to notify the Environmental Coordinator of any unusual odors or mold blooms. As a result of these procedures, JCPS was recognized by the Environmental Protection Agency in 2002 for Indoor Air Quality Excellence (EPA, 2002).

The most significant problem the district faces in this area is mold. It can occur as a result of outside or indoor conditions. Outside conditions are often caused by puddling outside doors or windows. Indoor causes can be more varied. Often, blooms are reported in late summer, as classrooms are opened in preparation for the beginning of

the school year. In the humidity common in the region, air conditioning may need to be run constantly to keep moisture from building up inside. The respondent recounted a particularly difficult problem in a basement classroom. Mold returns to one wall regularly despite cleaning, repainting and installing a dehumidifier. He believes the problem has to do with the orientation to the sun. It heats that wall and draws moisture through to the cooler air within. The only solution he has come up with is to strip the brick off and add a waterproofing membrane or shade the wall with a tree.

Local Offsets and Reduction in Air Travel Emissions. Offsets are strategies for reducing emissions in other areas of the community to make up for emissions produced by the institution. This could include planting trees, insulating homes or buying Renewable Energy Credits from a utility. There are currently no provisions in the district for offsetting greenhouse gas emissions. It is not within the scope of this research to determine the feasibility of such offsets.

Strategies such as carpooling or using Skype to attend meetings are available to the district but there is no policy recommending them and no means of tracking their use.

JCPS has dedicated office for indoor air quality and has been nationally recognized for their program. It responds promptly to any reports of unusual odors or mold. They also have a No Idle Policy that is strictly enforced with district employees. A Greenhouse Gas Emissions Inventory was conducted in 2009 and showed the majority of emissions come from buildings, and only a relatively small amount is related to vehicles or solid waste.

The district does not have a policy regarding emissions offsets. They also do not have a policy encouraging carpooling or using Skype to attend meetings.

JCPS does very well with regard to air quality measures such as no idling and indoor air quality, but does not have any policy to encourage the use of strategies to reduce greenhouse gas emissions associated with transportation to meetings and conferences.

Purchasing

In Purchasing, we wanted to know what policies are in place to support local and minority-owned businesses, availability of documents online, and the policies surrounding the purchase of paper products with recycled content. These initiatives that should be easy to implement and can have a significant impact on the district's overall carbon footprint. Information for this area was gathered from the Director of Purchasing.

Table 4 Results- Purchasing

Purchasing	Weight	Score	Rating	Additional Comments
Recycled Content Copy Paper	2	2	3	30% recycled content
Recycled Content Toilet Paper and Hand Towels	1	1	3	
Recycled Content Paper for Other Classroom Uses (construction paper, bulletin boards etc.)	1	0	0	
EPEAT Gold Computer Purchasing	2	2	2	Unwritten policy
Sustainable Cleaning Products	2	2	3	

Vendor Code of Conduct	1	0	0	
Policy Giving Preference to Historically Underutilized Businesses	0.25	0	0	
Policy Giving Preference to Locally Owned Businesses	0.25	0.25	2	Unwritten policy

Rating: 0= non-existent, 1=poor, 2=fair, 3=good, 4=excellent

State regulation. Under Kentucky state law, all purchasing decisions within JCPS are guided by the Kentucky Model Procurement Code, an extensive document that spells out policies and procedures for any financial transaction within all state and local government agencies. The local agency may require more restrictive policies in certain circumstances but may not make policy less restrictive. For example, the code does not specify what type of copy paper an agency must purchase, but the district requires that all paper contain 30% recycled content.

There is an aspect of the code that effects sustainability directly, which is called reciprocal preference. A state may give a specific preference to businesses located within that state, such as a 5% credit for construction contracts in Florida. If Florida offers a 5% preference for local businesses, those businesses would face a 5% penalty when applying for contracts in Kentucky. Thus, if a state gives explicit preference to local businesses, other states can penalize those businesses, in effect giving preference to their local businesses (Legislature, 2017). Sustainability includes economic equity and encourages the support of local businesses, which reciprocal preference accomplishes.

Partnership purchasing consortium. An unexpected benefit of the Partnership for a Green City was the development of the Partnership Purchasing Consortium, which includes the four partners, plus MSD, TARC, the Louisville Water Company and the

Louisville Regional Airport Authority. They have initiated joint purchasing contracts for single stream recycling, landfill waste disposal, electronics recycling, copy paper and green cleaning products. By combining purchasing power, the consortium can negotiate better prices on frequently purchased items.

Computers. As with any organization, JCPS needs to update computers and other electronics every year. Purchasing and disposal decisions can have a significant impact on sustainability. Although they do not have a specific policy regarding sustainability in electronics purchasing, the district reports that most desktop, notebook and monitor purchases have a gold rating from EPEAT, which rates electronics on multiple criteria, including production, design, energy use, and recyclability (EPEAT, 2017). Prior to March 2017, all electronics were scrubbed of data and sent to auction. As of this writing, they now have a contract with an e-cycling contractor for disposal.

Paper. JCPS purchased \$698,040 worth of white copy paper for fiscal year 2015-2016, all of which is 30% recycled content. When asked why paper is bought with 30% recycled content, the Director of Procurement said he thought it was cost. They would like to buy higher recycled content paper, but it is more expensive. The researcher was given a different reason at one time, that higher recycled content paper did not work well in the copiers. When the question was asked of the Director of the Partnership for a Green City, he said the actual reason had to do with perceived whiteness. 100% recycled content paper looked “too gray.” The district also has its own print shop, Materials Production, which does not use any recycled content paper, reportedly because the equipment has trouble with it.

A school goes through a lot of colored paper each year, from bulletin board paper to construction paper to posters and trim. There is no policy recommending recycled content in these products and a brief perusal through the catalogs of several vendors showed very few items would qualify. Many items had a recycling symbol next to them but a close reading showed that the symbol did not indicate content, but only the ability to be recycled.

Cleaning supplies. As per District policy, all cleaning products are Green Seal or Ecologo qualified. These are stringent, science-based standards that consider the full environmental impact of a product (Greenseal) or Ecologo (Laboratories) qualified. These are stringent, science-based standards that consider the full environmental impact of a product. These products are purchased through the Partnership Purchasing Consortium.

Vendor code of conduct. JCPS does not have a Vendor Code of Conduct that sets out expectations regarding environmental and social responsibilities of vendors with whom the district does business. When asked if there were any barriers to developing such a policy, none were deemed apparent. It was simply something the district had never discussed.

Historically underutilized and local businesses. Historically Underutilized Businesses is a designation granted by the Small Business Administration to businesses located within certain census tracts to help them gain access to federal contracts. JCPS does not have a specific policy in place for such businesses, or for local businesses, with one exception, but tries to utilize such companies for the many smaller purchases they

make to fill an immediate need. They keep documentation of who has been called and whether they were able to meet the need. Unfortunately, as with many small businesses, the product is not in stock or the price is too high. This is especially true to for bus parts, electrical or plumbing supplies. When asked whether these businesses had banded together to increase their buying power and make themselves more competitive, the director was not aware of any, but felt it could be useful.

The exception is construction where they do have a specific policy to support local businesses in construction. The main barrier to using local and Historically Underutilized Businesses is their inability to give financial preference through set-asides or allowances. If a business can provide a good or service at a price comparable to a larger out-of-state firm, they will be granted the contract.

Food procurement. When it comes to food procurement however, a specific policy is in place to ensure as much fresh food is produced within a 150-mile radius as possible. This policy was put in place around the same time the district moved food preparation out of the individual schools and into a centralized kitchen, approximately 5-10 years ago, and is especially evident when fresh local strawberries and lettuce are served in the spring and roasted winter squash is served in the fall. Many elementary schools in the district also participate in a fresh fruit and vegetable grant. Two to three times each week, students are given an afternoon snack of a fresh fruit or vegetable. Many times, these are also grown locally, something pointed out to the students as they bite into that fresh, crisp apple or wedge of sweet pepper.

The district also has a policy in place with regard to vegetables grown in school gardens. The students can sell their produce to the school board for serving in their cafeteria. They can also sell it outright in their own small farmer's market and keep the profits for their program, or they can give it away. Although there is usually not much produced, it is a point of pride when children see their classmates eating the food they grew.

Summary. JCPS utilizes the bulk purchasing power of the Partnership for a Green City to buy many environmentally sustainable products such as cleaning supplies and recycled content paper, as well as services such as single-stream recycling and electronics recycling. Although there is no policy mandating it, the district tries to use local small businesses as much as possible and also tries to buy food grown locally as well. Many schools also have gardens and are allowed to use their produce in any way they see fit, including selling it to the district for use in school lunches.

Although JCPS does much to ensure they are operating in a sustainable manner, the lack of a Vendor Code of Conduct prevents them from expanding their values and influence deeper into the local business community. An additional gap exists with regard to purchase of other paper products for classroom use. Schools use bulletin board paper, construction paper and colored copy paper. Although it may be difficult to find recycled content products, in order to develop the market, an attempt needs to be made to find sources.

When asked about barriers to making more sustainable purchases, the director of purchasing noted that he would be happy to buy whatever the district recommends, but it is up to them to develop policy. Until the policy changes, he will be “a good steward” of the public’s money, and search for the lowest price product that meets their needs. Regarding Vendor Code of Conduct and Historically Underutilized businesses, no one has ever suggested developing specific policies.

JCPS has taken the initiative to ensure that many of their purchasing decisions are more sustainable. They buy computers that are rated EPEAT gold and cleaning equipment that Ecologo or Green Seal certified. An attempt is made to purchase as much food within a 150-mile radius as possible. They do not currently have a vendor code of conduct or policy regarding Historically Underutilized businesses.

Transportation

Protostar asked very few questions on transportation, an area of significant impact in JCPS, so I added a number of questions focused on these issues. Given the number of buses, I wanted to know what they are doing to improve efficiency in pupil transport, whether it be efficient routing or hybrid buses. To gather this information, I interviewed the Director of Transportation Services.

Table 5 Results-Transportation

Transportation	Weight	Score	Rating	Comments
----------------	--------	-------	--------	----------

Presence of hybrid or alternative fueled vehicles	2	2	2	
Data on Forms on Transportation Used	1	0	0	No information available on bicycle or mass transit for students or staff
Percentage of students using school buses	4	4	4	70% of students ride buses
No Idle Policy	1	1	2	Strictly enforced with employees, not enforced with general public
Facilities for Bicyclists (Showers, lockers, covered storage)	0.25	0	1	Outdoor racks at all schools
Bicycle Transportation Plan	1	0	0	Plenty of racks, no policy encouraging use
Bus Passes or Other Plan to Promote Use of Mass Transit	1	0	0	City has a program to provide bus passes to students during summer
Policy to Encourage Carpooling	1	0	0	No policy

Rating: 0= non-existent, 1=poor, 2=fair, 3=good, 4=excellent

Jefferson County Schools have over one thousand buses. They traveled over seventeen million miles last year. Seventy percent of the district's one hundred and one thousand students rode those buses every day, well above the national average of fifty-five percent (Cox, 2014). Despite those numbers, greenhouse gas emissions involved in transportation are a small fraction of those emitted by the district's buildings. In 2009, the district reported total emissions of 218,297 tons of CO2 equivalent greenhouse gases. In contrast, the entire vehicle fleet emitted 4,267 tons CO2 equivalent gases, less than two percent of the combined total (PGC, 2009).

Even so, keeping all those buses on the road is expensive. JCPS typically burns 1.9 million gallons of diesel fuel per year and depending on options, a bus can cost around \$70,000 (Hovey-Brown) and JCPS buys several dozen each year. Those numbers add up quickly.

Busing for desegregation. Despite the costs, busing can be seen as a plus for sustainability. At 70% ridership, JCPS has one of the highest participation rates in the nation. Children on buses are not children being brought to school in private vehicles. Louisville Metro is also historically segregated. An interactive map recently published by the city shows the lingering effects of redlining and segregation in the city. Those neighborhoods singled out as being poor areas for investment beginning in the 1930s due low income and racial make-up are still largely minority and low-income today (Poe, 2017). JCPS was mandated by the U.S. District Court, in 1974, to institute busing for desegregation. At the time, the majority of African-Americans lived on the city's west side and attended majority minority schools. With busing, minority students were transferred to schools in the East End and white children were sent west. Recent research by the City of Louisville shows that segregation, whether by race or economics, is still a controlling factor in where people live (Poe, 2017). The program has gone through many changes over the years and busing is no longer mandated. However, the school district sees the value in integrated schools as a way of providing equity in education and so continues to assign students to schools based upon race and socio-economic factors.

Those buses crisscrossing the city can be unpopular. There have been numerous lawsuits throughout the years trying to stop them (Ross). In the most recent state legislative session, a bill was introduced to require students in Jefferson County to attend the school nearest their homes. However, thanks to the strategic use of magnet schools, many parents freely send their children across the district to attend schools that

best meet the needs of the students. With strong pushback from JCPS, parents and teachers, the bill was eventually stopped.

Current assignment plan. In its current form, students are assigned to schools within clusters. Each cluster was designed to have a mix of socio-economic and racial groups and transportation is guaranteed for all students who live more than one mile from their chosen school, including those in most magnet or optional programs.

As one can imagine, designing the clusters and figuring out bus routes each year are complex tasks. The district has every student's home and other descriptors plotted on a GIS map. They can use this information to effectively plot movements and spot trends. Using this data, JCPS has been able to reduce the total number of miles driven by over one million miles in three years, from 18,710,992 miles in 2014 to 17,316,594 miles in 2016, a drop of 7.5%. Average ride times have remained about the same for the past four years, at approximately twenty-nine minutes.

Hybrid buses. The district also attempted to improve efficiency by purchasing a fleet of fifty hybrid diesel-electric buses using grant money from the U.S. Department of Energy (JCPS, 2011). A hybrid bus costs roughly twice as much as a conventional bus (Hovey-Brown). It was hoped that the improved fuel mileage, up from an average of 7.5 mpg to 12 mpg, would offset the higher price but results were disappointing. According to district data, the hybrid buses actually perform worse, with an average of 7.33 mpg as compared to a conventional bus at 7.57 mpg (data provided during interview).

Table 6- Bus to Bus Efficiency Comparison

BUS #	MILES	beg_fy	Total Miles	SumOfgal	MPG	TRANS	Engine
B1142	70780	61133	9647	1387	6.96	HYBRID	6.7 ISB
B1143	76981	68356	8625	1196.5	7.21	HYBRID	6.7 ISB
B1144	68725	60170	8555	1095.1	7.81	HYBRID	6.7 ISB
B1145	93033	81299	11734	1561.3	7.52	HYBRID	6.7 ISB
B1146	93390	80414	12976	1614	8.04	HYBRID	6.7 ISB
B1147	68472	59043	9429	1209.5	7.80	HYBRID	6.7 ISB
B1148	94335	85678	8657	1214.1	7.13	HYBRID	6.7 ISB
B1149	67900	60404	7496	1085.7	6.90	HYBRID	6.7 ISB
B1150	57713	48546	9167	1360.9	6.74	HYBRID	6.7 ISB
B1151	74244	67241	7003	935.9	7.48	HYBRID	6.7 ISB
B1152	73871	65004	8867	1198.6	7.40	HYBRID	6.7 ISB
B1231	86226	72406	13820	1750.9	7.89	HYBRID	6.7 ISB
B1232	46255	39860	6395	1003.8	6.37	HYBRID	6.7 ISB
					7.33		

BUS#	MILES	beg_fy	Total Miles	SumOfgal	MPG	TRANS	Engine
B1233	86859	75801	11058	1682.7	6.57	PTS 2500	6.7 ISB
B1234	94472	78746	15726	2038.9	7.71	PTS 2500	6.7 ISB
B1235	79542	60242	19300	2449.1	7.88	PTS 2500	6.7 ISB
B1236	128943	109149	19794	2449.7	8.08	PTS 2500	6.7 ISB
B1237	85854	71870	13984	1929.7	7.25	PTS 2500	6.7 ISB
B1238	91110	77985	13125	1665.6	7.88	PTS 2500	6.7 ISB
B1239	91386	80100	11286	1402.8	8.05	PTS 2500	6.7 ISB
B1240	89322	74299	15023	1891.7	7.94	PTS 2500	6.7 ISB
B1241	94299	79376	14923	2109.4	7.07	PTS 2500	6.7 ISB
B1242	99342	80235	19107	2587	7.39	PTS 2500	6.7 ISB
B1243	66033	56937	9096	1220.2	7.45	PTS 2500	6.7 ISB
					7.57		

For the last several years, the district has been buying buses with 6.7 ISB Cummins diesel engines, a small truck engine with a turbo charger, allowing it to be used in different applications. As they arrive from the factory, they make 350-375

horsepower (CumminsHub, 2017). This engine is preferred for reliability and ease of maintenance.

No idle policy. JCPS has had a No Idle Policy in effect for several years. It is focused primarily on buses but does include other district vehicles. The Director of Transportation said the policy is strictly enforced with buses, but also noted that such enforcement is dependent on principals for enforcement. He said the district is looking into monitors that could be placed on buses to track how long they spend idling. The policy also extends to private vehicles such as those belonging to parents waiting to pick up children, but such a policy is difficult to enforce. My experience is that the principal or other administrator goes through the car rider line several times at the beginning of the school year to remind people to shut their vehicles off, but there are no penalties for failing to do so. The No Idle policy is also printed on the back of hang tags used to identify vehicles in the car rider line. However, this message is only included if the tags are printed by the district print shop. Many are printed by school-level staff. Metal signs are posted as well.

Bicycling and walking. Although most schools have bike racks, they are often empty. Students can get training on bicycle safety but there is nothing set up to encourage it and the training is not mandated. Walking to school is not encouraged due to various safety concerns.

Summary. JCPS transports 70% of their students, well above the national average, and has managed to trim the total number of miles driven by 7.5% in the past three years. Greenhouse gas emissions from transportation are less than two percent of

total emissions. They also have a No Idle policy which is strictly enforced with district employees.

The biggest barrier to reducing emissions from buses is the need to transport students across town for desegregation. Many neighborhoods are very homogeneous, both economically and racially. The major barrier to walking or riding a bike to school is safety. The barriers most often cited as preventing children from walking or riding bikes to school are lack of sidewalks, heavy traffic or the fear of child predators.

The gaps in sustainability efforts center around behaviors. No consistent effort is made to encourage students or staff to use any less-polluting form of transportation. It is assumed that everyone will arrive at school or work in a motor vehicle. Carpooling is also not encouraged. Most students of JCPS arrive at school on buses. They may have been on those buses for more than thirty minutes but emissions from those buses is less than two percent of total emissions for the district. JCPS has tested hybrid diesel-electric buses but found them to be less efficient than the turbo-charged Cummins diesel they are currently buying. They have a No Idle Policy that is strictly enforced with bus drivers but inconsistently enforced with parents and others visiting school buildings. Bike racks are available at most schools but they are little used. Students and staff are not encouraged to walk or ride to school mostly due to fears for their safety.

Curriculum and Professional Development

The purpose of this section was to determine the presence of a variety indicators of a robust sustainability education program. We wanted to know about the number and kinds of sustainability groups and classes throughout the district, as well as whether opportunities were available to teachers to improve their knowledge and practice of sustainability education. We also wanted to know about partnerships with any other organizations that could possibly be connected to sustainability. Our source for this information was the Director of Curriculum and Community Engagement.

Table 7 Results- Curriculum and Professional Development

Curriculum, Professional Development and Community Engagement	Weight	Score	Rating	Comments
Student Groups with a Sustainability Focus	5	0	0	Not tracked
Membership in National Organizations Focused on Sustainability	2	2	2	Many organizations focused on social justice and student development, no environmental organizations
Collaboration with Local Organizations Promoting Sustainability	2	2	3	University of Louisville, University of Kentucky, Partnership for a Green City
Teacher Professional Development in Sustainability	5	0	0	None currently available
New Employee Orientation in Sustainability	2	2	4	Significant amount of time spent on recycling and energy conservation
Student Curriculum focused on Sustainability	10	5	2	Several magnet schools, some classes are available such AP Environmental Science or special topics from interested teachers, no tracking of such classes
Presence of School Gardens	0.25	0.25	2	17% coverage, no data on how many are active

0= non-existent, 1=poor, 2=fair, 3=good, 4=excellent

Public school teachers have many expectations put on them every day. They are expected to teach the academic skills for which they were hired. They must also often teach basic social skills such as how to interact with peers and how to handle difficult emotions. They also make sure children get a snack if they missed breakfast and students with special needs get the interventions they need. It can be difficult to put anything else into a teacher's day, and yet, without addressing sustainability as part of core content, students are not being adequately prepared for the world that awaits them. Thus, it is vital that issues surrounding the environment, social justice and equity become a seamless part of education. To that end, this is the most important area for sustainability development and possibly the most difficult to implement.

Resources. JCPS has many resources for hands-on learning about the environment, and several initiatives for developing high-functioning citizens.

JCPS is fortunate to have Blackacre State Nature Preserve as a resource for environmental studies. Blackacre is a 170 acre working farm with buildings dating back to the 1790s (Conservancy, 2017) . Managed through an agreement between three parties- JCPS, Kentucky State Nature Preserves Commission and Blackacre Conservancy- the farm is also open to the public most afternoons and weekends and is available for private events as well as nature study and contemplation. It became the state's first nature preserve in 1979 and JCPS began using it a few years later. It is also available for use by non-public schools as well as classes from local universities and other groups.

Although the administration would like more classes to use Blackacre as a field trip site, they do not provide the buses free of charge and money is often a controlling factor when deciding whether to go on a field trip at all. Thus, JCPS has gone into partnership with the Louisville Science Center to provide six-week after-school science camps where Science Center staff bring the museum to the school for elementary students free of charge.

Other community resources include the Louisville Nature Center, the Louisville Zoo, Jefferson Memorial Forest, Bernheim Arboretum and Research Forest, and Falls of the Ohio State Park. All of these organizations have educational programs on-site and most will also present programs at a school or other site. Cultural resources include Farnsley-Moremeyn Landing, Locust Grove, The Frazier History Museum and Kentucky Center for African American Heritage.

Collaborations. In collaboration with University of Louisville, the district has had students participating in the Brighside Environmental Youth Summit for more than twenty-five years. The Summit is a day of learning that kicks off a year of collaboration between professionals in the community and students in grades 5-12 that focuses on environmental issues. For the 2016-2017 school year, the focus is on the urban heat island effect, something of particular concern for the Louisville area. Schools that are invited to participate have weather stations on their property. These weather stations are strategically located throughout Jefferson County to help develop an accurate picture of temperature variability. Research released in 2014 determined that Louisville Metro had one of the fastest growing urban heat islands in the nation (Kenward, Yawitz, Sanford, &

Wang, 2014). Since then, all members of the partnership have been working together to develop a deeper understanding of the issues associated with it, and to find ways to mitigate it. As a result, students at these schools are true “citizen scientists.” The information they collect is being used in research conducted at the University of Louisville.

JCPS is also involved in a research project through the University of Virginia to investigate the effects of mindfulness training on K-5 students at several elementary schools. Although hard data is not yet available, anecdotally, the effects appear to be significant. The students spend fifty minutes twice a week in a class, as part of their Practical Living curriculum, learning strategies for calming their bodies when they become stressed and learning to think and eat mindfully. Teachers and parents have remarked on the changes they have seen with the children participating. It is hoped that by addressing these skills early in a student’s education, the benefits will accrue throughout his lifetime.

Incentives for developing sustainability subjects/courses. JCPS does not have any formal incentives or programs in place to encourage teachers to include sustainability in current courses or to develop new ones. The major barriers to developing such a program are money and lack of staff. There must be someone on staff who will be responsible for developing and maintaining such a program.

Presence of courses with a sustainability focus. Although JCPS does not have a database of courses offered throughout the district that are focused on sustainability, they do have several schools that are considered Environmental

Education magnets. It is not within the scope of this research to determine the quality of their programs.

Staff Professional development in sustainability. At this time, JCPS does not provide consistent training for teachers on integrating sustainability in the curriculum. They are working to align it with curriculum standards.

When it comes to New Employee Orientation, JCPS places a high value on explaining, not only what employees of JCPS do to support sustainability, but why. Of a four-hour orientation program, an entire hour is devoted to recycling, energy efficiency and other aspects of sustainability. Sustainable practices are addressed in two other three-hour trainings offered three times per year to custodial, clerical, food service and maintenance staff.

Community service participation. Students have many opportunities to participate in community service projects. Besides Beta Club and National Honor Society, they can join interest-specific clubs at their schools or they can participate in one of two programs that are designed specifically to build strong community leaders: Lead2Feed and WE Day.

Lead2Feed is a standards-based program for middle and high school students. Through a series of lessons, students are guided to select an issue in the community and, by partnering with a local 501c3 organization, to develop and carry through a plan to address the problem. They can then enter documentation of their project for recognition at the national level.

WE Day is an international day of recognition for students who have been engaged in community service projects throughout the year. With the motto, “From Me to WE,” the group aims to energize students to be socially aware and active members of their communities. To attend a WE Day event, student groups must complete one local and one international project during the school year.

Graduation pledge. When asked about the idea of a graduation pledge, the Director of Curriculum and Engagement found the idea to be interesting but something that had never been proposed before. She felt it was something that would require a structure at the individual school level to build toward it. Students would need to be exposed to principles of sustainability throughout their high school careers, if not before, in order to fulfill such a pledge. The pledge should be a concise statement of support for environmental principles and could be based on a more detailed statement with specific suggested behaviors that students have been taught to follow throughout the years.

Summary. JCPS puts a high priority on training new employees in recycling and energy conservation. They also regularly offer trainings to support staff on cleaning and building maintenance using environmentally safe products. They place a high priority on developing pro-social and leadership skills for students through a variety of programs throughout the district. They also have their own dedicated environmental learning center at an historic farm. The district also collaborates with universities and other organizations to promote citizen science and student engagement in finding solutions to environmental challenges.

Even though the district has multiple magnet schools with environmental programs, JCPS is lacking in integrating sustainability in many ways throughout the remaining schools. Although there are abundant resources for field trips to natural areas and cultural sites, they do not have funding for transportation. There is no professional development focused on integrating sustainability into the curriculum, no centralized database of classes offered within the district that integrate sustainability topics or school-level clubs or other organizations that focus on sustainability. There are also no incentives or support systems for teachers who want to integrate sustainability into their classes. The primary barrier to improving in these areas is staff and funding. There is no money set aside to hire someone to focus on sustainability in the curriculum or to pay for transportation for field trips to natural areas.

SUMMARY OF FINDINGS

Table 7 Summary of Findings and Overall Scores

Planning and Administration	Weight	Score	Rating	Comments
District-wide Sustainability Committee or Sustainability Coordinator or Office of Sustainability	3	0	0	
Sustainability Committees at Individual Schools	2	0	0	
Sustainability Plan	3	3	2	Uses outside plan (Partnership for a Green City)
Physical Campus Plan	4	4	2	Comprehensive plan but mentions nothing about energy efficiency or other sustainability goals
Climate Action Plan	2	2	2	
Overall Rating	14	9 (64.29%)	(1.20) poor	
Energy	Weight	Score	Rating	Comments
District-wide Energy Management System	4	4	4	
Energy Metering on all Buildings	2	2	4	
Renewable Energy	7	4	2	Several demonstration projects
Timers for Temperature Control	2	2	4	
Lighting Sensors	0.25	0.25	2	Being installed as part of renovations
LED Lighting	0.25	0.25	2	Being installed as part of renovations
Overall Rating	15.50	12.50 (80.65%)	(3.00) good	
Air and Climate	Weight	Score	Rating	Comments
Greenhouse Gas Emissions Inventory	2	2	3	Originally conducted in 2009, updated in 2014
Indoor Air Quality Plan	1	1	3	
Local Offsets Policy	.50	0	0	
Air Travel Emissions Reduction Policy	0.25	0	0	
Overall Rating	3.75	3.00 80%	(1.50) poor to fair	Lack of local offsets and air travel emissions policies pull down what would otherwise be a strong area

Purchasing	Weight	Score	Rating	Comments
Catalogs and Other Materials Online	1	1	1	Catalogs and purchase orders not on-line
Recycled Content Copy Paper	2	2	3	30% recycled content
Recycled Content Toilet Paper and Hand Towels	1	1	3	
Recycled Content Paper for Other Classroom Uses (construction paper, bulletin boards etc.)	1	0	0	
EPEAT Gold Computer Purchasing	2	2	2	Unwritten policy
Sustainable Cleaning Products	2	2	3	
Vendor Code of Conduct	1	0	0	
Policy Giving Preference to Historically Underutilized Businesses	0.25	0	0	<i>Rating not included in final calculation</i>
Policy Giving Preference to Locally Owned Businesses	0.25	0.25	2	Unwritten Policy <i>Rating not included in final subjective calculation</i>
Overall Rating	10.5	8.25 79%	(1.56) poor to fair	
Transportation	Weight	Score	Rating	Comments
Presence of hybrid or alternative fueled vehicles	2	2	3	
Data on Forms on Transportation Used	1	0	0	No information available on bicycle or mass transit for students or staff
Percentage of students using school buses	4	4	4	70% of students ride buses
No Idle Policy	1	1	3	Strictly enforced with employees, not enforced with general public
Facilities for Bicyclists (Showers, lockers, covered storage)	0.25	0	2	Outdoor racks at all schools <i>Rating not included in final subjective calculation</i>
Bicycle Transportation Plan	1	0	0	Plenty of racks, no policy encouraging use
Bus Passes or Other Plan to Promote Use of Mass Transit	1	0	0	City has a program to provide bus passes to students during summer
Policy to Encourage Carpooling	1	0	0	No policy
Overall Rating	11.25	7.00 62.22%	(1.50) Poor to Fair	
Curriculum, Professional Development and Community Engagement	Weight	Score	Rating	Comments

Presence of School Gardens	0.25	0.25	2	17% coverage, no data on how many are active
Student Groups with a Sustainability Focus	5	0	0	Not tracked
Membership in National Organizations Focused on Sustainability	2	2	2	Many organizations focused on social justice and student development, no environmental organizations
Collaboration with Local Organizations Promoting Sustainability	2	2	3	University of Louisville, University of Kentucky, Partnership for a Green City
Teacher Professional Development in Sustainability	5	0	0	None currently available
New Employee Orientation in Sustainability	2	2	4	Significant amount of time spent on recycling and energy conservation
Student Curriculum focused on Sustainability	10	5	2	Several magnet schools, some classes are available such AP Environmental Science or special topics from interested teachers, no tracking of such classes
Overall Rating	26.25	11.25 42.86%	(1.86) poor to Fair	

Rating: 0= non-existent, 1=poor, 2=fair, 3=good, 4=excellent

Table 8 Overall Score

Category	Points Earned	Possible Points	Percent of Available Points	Final Rating
Planning and Administration	9	14	64.29%	
Energy	12.5	15.5	80.64%	
Air and Climate	3.0	3.75	80.00%	
Purchasing	8.25	10.5	78.57%	
Transportation	7.0	11.25	62.22%	
Curriculum, Professional Development & Community Engagement	11.25	26.25	42.86%	
Average Across all Categories	51.00	81.25	62.77%	Silver

Protostar Score: Bronze 25-44%; Silver 45-64%; Gold 65-84%, Platinum 85% or above

Jefferson County Public Schools (Kentucky) is one of the largest school districts in the nation. It serves a diverse student body stretched across 380 square miles (Gazeteer) and speaking one hundred twenty-three languages (JCPS, 2017d). The district has been tracking energy use since 1979 and has had an energy auditor since 1983. They take energy efficiency seriously.

They also work very hard to move the organization toward zero waste, using single stream recycling in all buildings. Unfortunately, in a district this large, it can be difficult to get the same results across multiple buildings and recycling is a prime example. All buildings have the same blue bins, enough for every classroom or office, but recycling rates vary greatly, from fifteen pounds per student per year to ninety-four pounds per student per year.

The district is also part of the Partnership for a Green City, a collaboration between the school district, Metro Louisville, Jefferson County Community and Technical College and the University of Louisville. As a result of the Partnership, a full sustainability assessment was completed in 2009 and updated in 2014. A strategic plan was also written through the Partnership. This is the guiding document JCPS uses as they institute changes for sustainability. This document gives education as a strategic theme, but the only actions it proposes refer to informing the general public. In addition, while the university and the city pledged to raise their scores on comprehensive sustainability assessments (AASHE STARS and STAR community), no means of measuring JCPS's progress is given.

One of the challenges JCPS faces is how to reduce vehicle miles driven. Jefferson County is a historically segregated city that actively works to reduce that segregation. This includes busing students around the district to achieve racial and economic integration. As a result, they have a lot of buses, and those buses drive a lot of miles. Surprisingly, the sustainability assessment showed emissions from buses to be a small fraction of those from operating school buildings. Thus, JCPS has focused more on building energy efficiency. They have been tracking energy use for more than thirty years and use that information to decide what renovations are most economically efficient. Given that Kentucky has very low electricity prices, thanks to extensive use of coal, it can very difficult to make geothermal and renewable energy pay off.

As a member of the Partnership for a Green City, JCPS has been able to negotiate lower prices for many commonly used supplies. For example, they have been buying 30% recycled content copy paper for several years and have switched to Green Seal or Eco logo cleaning supplies as well. Although they do not have a written policy encouraging the use of local vendors, it is reported to be standard practice. There is currently no vendor code of conduct to encourage sustainable practices from those doing business with JCPS.

Although JCPS has been very forward thinking in many areas behind the scenes, they lag behind when it comes to those things that address the core mission of educating students. They have several magnet programs for environmental education (one elementary(JCPS), two middle(JCPS) and three high school(JCPS)) , but there seems to be no effort to bring the conversation into the remaining schools.

Aside from what may be offered at magnet schools, there are no professional development opportunities for teachers to learn about sustainability or how to integrate it into their teaching. There is no tracking of the number of classes that address sustainability in their content nor are there any recognized professional learning communities that directly address any aspect of sustainability.

Limitations

Our research was conducted using the best data available at the time and is intended to be used by the district for guidance as they make future decisions surrounding issues of sustainability. Given that some of the conclusions of this research are based on recollections and subjective evaluations of respondents, it is possible that they may be legitimately disputed. For example, although the Director of Transportation said that the No Idle Policy is strictly enforced with employees, “strictly enforced” is a vague, subjective term that may mean different things to different people. Moreover, studies of actual compliance often find that compliance is lower than believed by administrators. There is anecdotal evidence indicating this may be the case for the no idle policy at JCPS as well. In addition, some of the data, such as the Greenhouse Gas Emissions Inventory, used in the evaluation may be outdated. It would be helpful to repeat the study to determine whether the ratio of emissions from vehicles to that from buildings has changed significantly over the intervening years. It is also noteworthy that many pieces of data requested, particularly related to curriculum and student engagement, were not available. It is hoped that JCPS will begin collecting this data and

using it in future decision-making, as well as begin monitoring and objectively assessing compliance and other important information.

SYNTHESIS AND RECOMMENDATIONS

The following recommendations are based on the data we had available. Though minor aspects of the data could be disputed, we believe that the following recommendations represent major trends in sustainability of JCPS. For example, though compliance with some policies may be questioned, and there may be some gaps in the data, overall strengths and shortcomings of JCPS sustainability consistently emerged. For instance, Energy was a clear relative strength for JCPS, whereas as overall Planning and Administration was a relative weaknesses consistently. Therefore, these recommendations should be valid to guide overall decisions regarding major categories of sustianability.

Recommendations for Future

Overall, Jefferson County Public Schools have done a quality job applying principles of sustainability in their overall operations, with an emphasis on energy efficiency. They have piloted a number of energy projects such as geothermal HVAC and solar hot water and electricity generation. Given the low cost of electricity in the state, alternative energy is not cost effective at this time. Much still needs to be done to demonstrate a commitment to sustainability within school culture. When compared to the cost of building renovations, many of these initiatives are low-cost, such as hiring a sustainability coordinator and adding sustainability topics to professional development. With these pieces in place, the movement toward more sustainable behaviors can begin.

In an ideal world, all of the following recommendations would be implemented at once. In the real world, however, we must set priorities. Thus, these are all the recommendations in depth, to be followed by each section prioritized.

In this section, we outline recommendations to improve the comprehensive sustainability of the JCPS district in each of the areas identified in our assessment. To help guide administrators in setting priorities, given realistic resource constraints and opportunities, we outline three different solution scenarios and their anticipated outcomes for JCPS: an ideal, realistic, and business-as-usual scenario. The Ideal Scenario outlines the best possible course of action, where JCPS seeks to address all the gaps in sustainability identified in our Protostar assessment. The Realistic Scenario takes into account the realistic resource constraints of JCPS and sets priorities based on a balance of feasibility and anticipated benefits (e.g., return on investment, environmental and public health benefits). The Business-As-Usual Scenario represents what is projected to happen if JCPS continues on its current course, without any major improvements in the key gaps identified in this study. This particular scenario serves as a benchmark to compare potential benefits of the Ideal and Realistic strategies.

Planning and Administration

- Sustainability Office
- Protostar Assessment
- Strategic Plan
- Focus groups

- School-based Sustainability Councils
- Neighborhood Schools
- Mass transit passes
- Grants

Energy

- Student and staff engagement
- Daylight sensors
- Energy savings rebates to schools

Air and Climate

- Ceiling fans
- Wise use of natural light and ventilation

Purchasing

- Sustainable electronics purchasing policy
- Recycled content paper
- Cafeteria trays and flatware
- Historically Underutilized Businesses
- Local businesses
- Procurement

Transportation

- Transit passes
- Community schools
- Bicycle safety training
- Walking school bus
- Bus monitors
- No Idle policy
- Staff and student modal split

Curriculum and Professional Development

- School-Based Sustainability Councils
- Professional Learning Communities
- Curriculum selection
- Professional Development Liaison
- Professional development abroad
- Professional development locally
- Professional development online
- Embedded cultural diversity
- Incentives for developing sustainability-themed courses

Ideal Scenario

There are areas identified throughout this assessment where improvements to sustainability could be made. Energy is the area where the most progress has been

made, with a long-term focus on energy efficiency. The areas needing the most improvement are Curriculum and Professional Development. Although the district makes a concerted effort to address social justice issues among students, they have a long way to go towards addressing the environmental component. Professional development of teachers in all aspects of sustainability would help to begin the dialogue among staff, and between staff and students. JCPS could then focus on helping teachers integrate this information into their lessons to develop sustainability literacy within the student body. The district also needs to commit funds to hire a Director of Sustainability (or comparable position). This person could begin the process of developing a sustainability plan focused on the needs of Jefferson County Schools and guide the development of related curriculum.

Planning and Administration

Sustainability Office- Establish an office, with a director, focused solely on the coordination of sustainability activities within the district. This office would report directly to the superintendent and the school board and receive input from all areas of administration, from building and grounds through curriculum development and food service.

Protostar Assessment- The district should complete a full Protostar assessment to quantitatively measure all aspects of district operations and use it as a guide for determining next steps.

Strategic Plan- JCPS should convene a committee involving representatives from all stakeholder groups to develop a strategic plan tailored to the needs of the district. This plan should include a strong emphasis on staff education and curriculum development, in addition to continued emphasis on energy efficiency and sustainable purchasing. The strategic plan should include specific, measurable targets such as reducing landfill waste fifty percent and greenhouse gas emissions forty percent by 2025.

Focus Groups- Convene a series of focus groups to determine which environmentally-sustainable behaviors the district should focus on improving and what the barriers are to changing those behaviors. For example, the groups could decide increasing recycling is the highest priority. Additional focus groups would be convened to determine the barriers to increased recycling. Using data-driven research strategies, determine how to address the issue, pilot the program and collect data to determine the effectiveness of the chosen strategy before taking it district-wide.

School-Based Sustainability Councils – Encourage schools to establish councils that can work with district staff to identify priority needs on each campus and work together to provide solutions. This could mean looking at flooding issues together and deciding to work with students to build swales and detention basins to capture rainwater and allow the ground to absorb it. At an elementary school, it could mean planting more trees and getting the students involved. By working directly with the district at the planning stage, it is hoped that more projects could get approved and implemented effectively. This also provides an opportunity for student involvement and project-based student learning activities (see Curriculum).

Mass Transit Passes- Work with TARC to provide bus passes for all students. As a pilot program, eliminate buses for high school students at some schools and require them to use mass transit. The passes could also be used outside of school hours. For all grades, the passes could be used to provide transportation for field trips. Students could be involved in route planning. This would not only save money, it would teach children how to use the system, increase ridership and expand TARC routes into areas not currently served.

Grants- JCPS should work with other stakeholder groups in Louisville Metro to seek out and apply for grants that will enhance sustainability initiatives. An example would be the collection of left-over food from area schools for donation to homeless shelters. Taking the idea further, why not collect the food and redistribute through JCPS. High school students are being fed dinner/late afternoon snack at some schools following after-school activities. Why couldn't the district collect up excess food and serve it to the students and the community at selected schools?

Recycling Rates- Increase awareness of what can be recycled by replacing larger waste cans with smaller cans labeled for food waste only. With the exception of food waste, 85% of waste produced in the district is recyclable and a pilot project is in place to compost food waste. It needs to be expanded to more schools.

Curriculum and Student Engagement

School-Based Sustainability Councils- Encourage schools to establish councils that work toward recognizing opportunities within the existing curriculum and on the school grounds that will enable teachers to use the school as a living laboratory. They can also determine priorities for developing projects that can both enhance sustainability and provide learning opportunities. An example would be the planting of a rain garden with butterfly friendly plants. It would help to keep rain water out of the sewer system and provide habitat for insects.

Professional Learning Communities- establish PLCs at elementary, middle and high school levels to support teachers who want to integrate environmental and sustainability education into their teaching.

Curriculum Selection- Require of publishers that reading and social studies curricula embed environmental topics in their programs. This is especially pertinent at the elementary level, where teachers depend on structured reading and science programs purchased or developed by the district. An example of this would be the requirement that elementary reading programs include at least one text that addresses environmental issues like littering, air pollution or endangered species in each unit.

Science curricula could include more experiments that require using the school grounds as a living laboratory. Once teachers are accustomed to using the natural world that surrounds them, it is hoped that they will find other ways to bring the local environment into their classrooms.

Local Curriculum- In order for curriculum to be relevant to students, it is wise to address local issues whenever possible. For example, when teaching about watersheds, lessons should revolve around local streams that students may have direct experience with, rather than distant rivers and bays. When students understand and appreciate the place they live in, they are more likely to take actions to protect it.

Professional Development Liaison- Establish an office where teachers can go to learn about PD opportunities outside the district. There are many such opportunities available but it can be difficult to learn about them.

Professional Development Abroad- Provide opportunities for teachers to travel during the summer to different areas, especially different countries, to learn about the environmental challenges people in other parts of the world are facing. These opportunities could be provided directly by JCPS through grants or through a clearinghouse of study opportunities presented by other organizations. PD credit should be granted for these trips and the possibility of providing college credit through a cooperative agreement with a local university could be explored.

Professional Development Locally- There are many resources available for teachers to learn about issues in sustainability. Many are online and others could be presented in-person. Make it easier for community organizations to offer PD credit for training they wish to offer.

Professional Development Online- Explore online learning communities like those below for augmenting professional development in sustainability.

- Green Schools National Network- provide evidence-based resources and tools to assist in the journey toward sustainability
- Green Schools Alliance- provides training for professionals and students, offers certifications for facilities managers and building operators, sponsor of Protostar
- Green Education Foundation- a national non-profit online education forum providing coursework for students and educators

Professional Development Communications- a communication system such as personalized newsletters should be established to advertise professional development opportunities. Teachers could check off area that they are interested in, and as PDs come up, they are automatically notified.

Embedded Cultural Diversity- Provide opportunities to celebrate the diverse cultures that make up our schools. Ideally, this should happen at the level of each school but could be modeled at a district level. Perhaps food from the various countries represented in the district could be served in the cafeterias on a monthly basis. This could be coordinated with short videos or posters (produced by the students?) giving some facts about the country/region.

Incentives for Developing Sustainability-Themed Courses- The University of Louisville has a Green Threads program where professors are paid a stipend to attend a day-long seminar designed to give them the tools and resources to either integrate sustainability directly into courses they are currently teaching or develop entirely new courses that have sustainability in one of its several aspects as a theme. Given that sustainability

encompasses economic and social justice as well environmental protection, all teachers could potentially benefit.

Energy

Energy Dashboards in Each School- Each school should have access to real-time energy consumption data and the information available should be integrated into the curriculum.

Student and Staff Engagement- Inform and engage students and faculty at schools that are about to, or have already undergone renovation. Let them know what energy saving measures have been done and what they can do to operate the building efficiently. Give them data from prior years and have them compare energy consumption.

Daylight Sensors- Rooms with large windows and sufficient daylight could be outfitted with light sensors that automatically turn lights off when ambient light exceeds preset levels.

Energy Savings Rebate- Give schools an incentive to save energy. Establish a baseline year to measure their consumption against and give some of the money back each year that has been saved. For example, the first year, schools could get back 100% of their savings. The second year, they could get back 75%. Then 50% the next year and 25% the last year. With such an incentive, it is to be hoped that schools will continuously look for energy-saving behaviors to increase pay-back and those behaviors will have become habit by the end of year four.

Green Roofs- Green roofs have been shown to reduce energy consumption and have the added benefits of helping to manage stormwater reducing airborne emissions and reducing the urban heat island effect (FEMP).

High Efficiency Vending Machines-Such vending machines, both with and without occupancy sensors, can reduce energy consumption. Vending machines should also be shut down over extended breaks.

Refrigerators and Other Appliances- Personal appliances should be banned from all classrooms and offices. This should include not only refrigerators, but coffee makers and space heaters, as well as any other energy-intensive devices. Additional large refrigerators can be placed in convenient areas throughout the buildings.

Air and Climate

Ceiling Fans- Install ceiling fans in classrooms to improve air circulation and comfort levels with lower energy use.

Wise Use of Natural Light and Ventilation- develop an information program that encourages teachers and other building occupants about how to take advantage of natural light and solar heating through the strategic use of window coverings. In addition, reflective “light shelves” can be made in-house and installed across windows to enhance light penetration into rooms. Information about the health benefits of opening windows on mild days could also be dispersed.

No Idle Policy- Provide students and/or staff with training in how to effectively frame their argument for turning off engines as well as informational brochures. Research has shown that when an argument is framed properly, it is more effective at changing behavior (Cialdini, 2003). Then have them go out to the car-rider line several times at the beginning of the school year to hand out the flyers and explain why No-Idle is important, and occasionally thereafter to remind people.

Active Monitoring of Indoor Air Quality- The current system requires staff notify the administration of an air quality concern. Personnel should begin visiting schools and other jobsites to measure levels of nitrous oxides, carbon dioxide, particulates and volatile organic carbons, all common indoor air pollutants that affect the health and productivity of people exposed to them.

Purchasing

*Sustainable Electronics Purchasing Policy-*Although JCPS currently buys many of their electronics with EPEAT Gold ratings, without a specific policy in place requiring it, it would be easy for someone to write proposals for computers with different specifications. It is important for the district to have the policy in writing to ensure that all electronics purchases meet the highest standards for sustainability.

Recycled Content Paper- Establish policy and work with vendors to source bulletin board paper, construction paper and other paper products with recycled content.

Electronics Recycling- establish e-cycle drives throughout the District to encourage employees and community members to recycle old electronics responsibly.

Cafeteria Trays and Flatware- Replace non-recyclable single-use cafeteria items with reusable dishes and flatware. If that is not possible, switch to products with minimal environmental impact (made with recycled content and recyclable).

Historically Underutilized Businesses- Establish a policy that supports businesses that fall under this designation and offer business owners a liaison who can provide advice on completing proposals and bids that meet JCPS's standards.

Local Businesses- Establish a policy that supports locally owned small businesses and offer business owners a liaison who can provide advice on completing proposals and bids that meet JCPS's standards.

Procurement- Explore the Green Schools Alliance Purchasing Solution for ways to reduce expenses on sustainable solutions beyond that offered by the partnership. Encourage vendors to provide more items with recycled content, especially school supply companies.

Transportation

Transit Passes- Explore the use of public transit for field trips and older students. When using TARC for field trips, students could be engaged in the actual planning process by

helping to select the route and determining what time they should be ready. The length of the trip would also no longer be limited by school bus availability. If high school students used public transit instead of school buses, it would be a win in many ways. If a student overslept, he would no longer have to miss school because nobody can get him there. He could just catch the next bus. Putting students on mass transit would also increase ridership, bringing buses into neighborhoods and making them more available to other members of the community. It would also reduce the number of buses needed by JCPS and reduce rush hour congestion. Students who become accustomed to using public transit as children will be more apt to continue using it as adults.

Neighborhood Schools- In areas that already meet criteria for diversity, start a pilot program in elementary schools to eliminate buses or reduce bus miles traveled. Use the money to pay staff or community members to lead “walking school buses” for children within a mile of school. Such a strategy will likely have benefits throughout the school as children have a chance to get exercise and social interaction before and after school. Remaining funds could be used to hire more staff or provide other resources as the SBDM determines.

Bicycle Safety Training- At some point in elementary school, all student should get training in how to safely ride a bicycle and interact with traffic. This should be active training on bicycles in a controlled area. If possible, students should be given the opportunity to practice their skills as part of a rolling field trip to a local attraction. Imagine a bicycle safety class at Farnsley-Moremeyen Landing, followed by a ride along the Louisville loop with a local historian to learn about the Ohio River’s place in local

history. Bicycle safety training should be revisited in middle school or early high school as students get old enough to ride full-size bikes in traffic, with an emphasis on rules of the road that a motor vehicles must obey as well.

Walking School Bus- In order to encourage more students to walk to school rather than have caregivers drive them, walking school buses could be initiated. This is when staff members, or designated members of the community, walk through a neighborhood along a predetermined route and students join them. This would be of benefit in multiple ways. Fewer cars would be on the road or at the schools. Students would be able to walk and chat with their friends and develop relationships with caring adults, everyone would be awake and alert when they got to school and the walk home in the afternoon would also be a time to relax after what may have been a stressful day. Finally, students, and adults, would learn that walking can be a pleasant form of transportation.

Carpooling for students and staff- Establish an online portal where parents and staff can register and connect with others who wish to carpool to school or work.

Staff and Student Modal Split- Conduct a survey to determine how staff and students are getting to schools each day. This information could be used to inform decisions regarding possible future programs like Ride-Share, parking needs and things yet to be determined.

Realistic Scenario

It is not realistic to see all these programs started at once, thus, it is important to prioritize. The following is a list of programs that should be undertaken first.

Planning and administration. These items were selected because of their value in building consensus and guiding the development of sustainability efforts throughout the district.

1. Sustainability Office
2. School-Based Sustainability Councils
3. Protostar Assessment
4. Focus groups
5. Strategic Plan

Curriculum and student engagement. These items were selected as being most important due to their potential impact, with those more difficult or expensive to implement following those expected to be low-cost.

1. Professional Learning Communities
2. School-Based Sustainability Councils
3. Professional Development Opportunities
4. Embedded Cultural Diversity
5. Incentives for Developing Sustainability-Themed Courses
6. Curriculum Selection

Energy. With so much already being done in the district to improve energy efficiency, the remaining areas involve increasing engagement of students and staff by making energy use visible and adding incentives to drive behavior change.

1. Student and Staff Engagement
2. Energy Dashboards in Each School
3. Energy Savings Rebates
4. Daylight Sensors

Air and climate. Air and climate are difficult areas to address due the complex nature of managing indoor air quality. The following areas are cost effective ways of addressing air quality in and around schools.

1. Wise Use of Natural Light and Ventilation
2. Improved Communication and Enforcement of No Idle Policy
3. Ceiling Fans

Purchasing. The first two items were selected as important due to their impact toward local businesses and the ease of developing formal policies guiding activities that are already taking place. The remainder have to do with purchase of frequently used items. Changes here would likely have a high impact.

1. Liaison for Local and Historically Underutilized Businesses
2. Develop Policies to Formalize Informal Policies that Control Purchase of Electronics and Preference for Historically Underutilized and Local Businesses
3. Procurement

4. Recycled Content Classroom Paper
5. Sustainable Cafeteria Trays and Flatware

Transportation. Given the difficulty of increasing fuel efficiency of buses, the focus of these recommendations is on diversifying the modes of transportation and long-term environmental benefits of using a variety of less energy intensive modes of travel.

1. Transit Passes
2. Walking School Bus
3. Bus Monitors
4. Bicycle Safety Training
5. Student and Staff Modal Split

Business as Usual Scenario

If JCPS continues to operate as it currently does, it is likely energy efficiency will continue to improve. As energy prices increase, they will likely adopt renewable energy and other more expensive strategies. They will continue to work, slowly, toward zero waste.

The district will also continue to ignore many of the opportunities zero waste and energy efficiency present to engage students in education that is relevant and empowering. They will continue to focus on many aspects of social justice but miss out on the connections between social justice and environmental justice. It is likely they will

be producing students unprepared to see the connections among many different issues and unable to find creative solutions to problems known and unknown.

In a society that is ever-evolving, more of the same is not what will be needed. Society needs creative, engaged teachers producing creative engaged students. To get there will require bold moves and the ability to think beyond test scores. Sustainably literate citizens come out of schools that have made sustainability an integral part of their curriculum.

SUMMARY

Jefferson County Public Schools (Kentucky) is one of the largest school districts in the nation. It serves a diverse student body stretched across 380 square miles and speaking one hundred twenty-three languages (JCPS, 2017d). They have several magnet programs for environmental education (one elementary (JCPS), two middle (JCPS) and three high school (JCPS)), but there seems to be no effort to bring the conversation into the remaining schools.

Sustainability is not just about protecting the environment. It also entails ensuring that the world is a just and equitable place for all species. It recognizes that humans have a place at the table but their needs must be balanced with the needs of other species in order to have a planet that supports life in all its diversity.

It is not an objective you can meet in a day, or a decade. It is the journey of generations, and must be traveled one step at a time. Jefferson County Public Schools

have already begun the journey, but to meet the needs of future generations, they need to take the students along. This means bringing discussions of energy efficiency into the classrooms. It means talking about the effects of pollution on our air, water and land. It also means addressing the injustices we see around the world. And it means discovering how all these things are tied together and what we can do differently.

REFERENCES

- ABA. (2017). The 2000 Model Procurement Code for State and local Governments. In: American Bar Association.
- Allen, D. E., Donham, R. S., & Bernhardt, S. A. (2011). Problem-based learning. *New Directions for Teaching and Learning*, 2011(128), 21-29. doi:10.1002/tl.465
- Animal Pollination. Retrieved from <https://www.fs.fed.us/wildflowers/pollinators/animals/>
- Association, E. S. (2013). protostar technical manual.
- Bernard, H. R. (1988). *Reserch methods in Cultural Anthropology*. Newbury Park, California: SAGE Publications.
- Boles, S. What are the Differences Between Scope 1, 2 and 3 Greenhouse Gas Emissions. Retrieved from <http://icomplisustainability.com/index.php/ask-the-expert/ghg-management/item/63-what-are-the-differences-between-scope-1-2-and-3-greenhouse-gas-emissions/63-what-are-the-differences-between-scope-1-2-and-3-greenhouse-gas-emissions>
- Bullock, G., & Wilder, N. (2016). The Comprehensiveness of Competing Higher Education Sustainability Assessments. *International Journal of Sustainability in Higher Education*, 17(3), 282-304.
- Cialdini, R. B. (2003). Crafting Normative Messages to Protect the Environment. *Current Directions in Psychological Science*, 12(4), 104-109.
- Conservancy, B. (2017). Blackacre History. Retrieved from <http://blackacreconservancy.org/about/history/>
- Cox, W. (2014). School buses: America's largest transit system. Retrieved from <http://www.newgeography.com/content/004801-school-buses-americas-largest-transit-system>
- CR. (2013). A mini fridge can max out your utility bill. Retrieved from <http://www.consumerreports.org/cro/news/2013/03/a-mini-refrigerator-can-max-out-your-utility-bill/index.htm>
- CumminsHub. (2017). 6.7L Cummins ISB Turbodiesel: 6.7L Cummins Specs, Info and Resources. Retrieved from <http://www.cumminshub.com/67.html>
- Dempsey, N., Bramley, G., Power, S., & Brown, C. (2009). The social dimension of sustainable development: defining urban social sustainability. *Sustainable development*, 19(5), 289-300.
- DOE, U. (2017a). Energy Saver Guide. Retrieved from https://energy.gov/sites/prod/files/2014/09/f18/61628_BK_EERE-EnergySavers_w150.pdf
- DOE, U. (2017b). Landscaping for Energy Efficient Homes. Retrieved from <https://energy.gov/energysaver/landscaping-energy-efficient-homes>
- Eccles, J. S. (1993). Negative Effects of Traditional Middle Schools on Students' Motivation. *Elementary School Journal*, 93(5), 553-574.
- Economic equity. Retrieved from <http://www.businessdictionary.com/definition/economic-equity.html>
- EIA. (2017). State Electricity Profiles. Retrieved from <https://www.eia.gov/electricity/state/>

- Encyclopedia, B. (2017). Return on Investment ROI: Definition, Meaning Explained, Example Calculation. Retrieved from <https://www.business-case-analysis.com/return-on-investment.html>
- Environmental Justice. Retrieved from http://www.sourcewatch.org/index.php/Environmental_justice
- Environmental Justice/Environmental Racism. Retrieved from <http://www.ejnet.org/ej/>
- EPA. Managing Asthma in the School Environment. Retrieved from <https://www.epa.gov/iaq-schools/managing-asthma-school-environment>
- EPA. (2002). Jefferson County Public Schools (Louisville, Kentucky) Receives U.S. Indoor Air Quality Excellence Award [Press release]. Retrieved from <https://yosemite.epa.gov/opa/admpress.nsf/6427a6b7538955c585257359003f0230/0b08a226877c910e8525732c003fdc2e!OpenDocument&Start=2.3&Count=5&Expand=2.3>
- EPA, U. S. (2017). Learn about Sustainability. Retrieved from <https://www.epa.gov/sustainability/learn-about-sustainability#what>
- EPEAT. (2017). Understanding EPEAT. Retrieved from http://www.epeat.net/documents/purchaser-resources/EPEAT_Basics_Preso_12%200710.pdf
- Estes, C. A. (2004). Promoting Student-Centered Learning in Experiential Education. *Journal of Experiential Education*, 27(2), 141-160.
- FEMP. Federal Technology Alert- Green Roofs. Retrieved from http://www.nrel.gov/tech_deployment/pdfs/femp_fta_green_roofs.pdf
- Fraenkel, J. R., & Wallen, N. E. (2006). *How to Design and Evaluate Research in Education, Sixth Edition*. New York, New York: McGraw-Hill.
- Gazeteer, K. A. a. (2017). Kentucky Counties. Retrieved from <http://kyatlas.com/kentucky-counties.html>
- Gilburn, A. S., Bunnefeld, N., Wilson, J. M., Brereton, M. S. B. M., Fox, R., & Goulson, D. (2015). Are neonicotinoid insecticides driving declines of widespread butterflies? *PeerJ*, 3(e), 1402.
- Greenseal. (2017). Green Living. Retrieved from <http://www.greenseal.org/GreenLiving.aspx>
- Hovey-Brown, J. (2012, February 17, 2012). Hybrid school bus miles per gallon disappoints district at first glance. *The Crittenden Press*. Retrieved from http://www.kentuckynewera.com/web/news/article_7bf9b07c-58d1-11e1-9f16-001871e3ce6c.html
- JCPS. Curriculum Frameworks and Maps. Retrieved from <https://www.jefferson.kyschools.us/department/curriculum-management>
- JCPS. (2011). Yellow bus, green technology. *Monday Memo*, 33.
- JCPS. (2017a). Choices- Elementary Schools. Retrieved from <https://www.jefferson.kyschools.us/sites/default/files/forms/Choices-Elementary%20Schools.pdf>
- JCPS. (2017b). Choices- High School. Retrieved from <https://www.jefferson.kyschools.us/sites/default/files/forms/Choices-High%20Schools.pdf>

- JCPS. (2017c). Choices- Middle School. Retrieved from <https://www.jefferson.kyschools.us/sites/default/files/forms/Choices-Middle%20Schools.pdf>
- JCPS. (2017d). JCPS Facts- District Profile. Retrieved from <https://www.jefferson.kyschools.us/node/5305>
- Kenward, A., Yawitz, D., Sanford, T., & Wang, R. (2014). *Summer in the City: Hot and Getting Hotter*. Retrieved from <http://assets.climatecentral.org/pdfs/UrbanHeatIsland.pdf>
- Laboratories, U. (2017). ECOLOGO Product Certification. Retrieved from <http://industries.ul.com/environment/certificationvalidation-marks/ecologo-product-certification#cleaning>
- Lee, E., & Hannafin, M. J. (2016). A Design Framework for Enhancing Engagement in Student-Centered Learning: Own It, Learn it, and Share it. *Education Technology Research and Development*, 64(4), 707-734.
- Kentucky Model Procurement Code KRS Chapter 45A, 45A.494 C.F.R. (2017).
- LG&E. (2017). Saving Energy and Money. Retrieved from <https://lge-ku.com/saving-energy-and-money>
- Lin, A. (2015). Citizenship Education in American Schools and its Role in Developing Civic Engagement: A Review of the Research. *Educational Review*, 67(1), 35-63.
- Malone, E. L., Diamond, R., Wolfe, A. K., Sanquist, T., Christopher Payne, & Dion, J. (2013). Implementing sustainability: the Behavioral-Institutional Dimension. *Sustain*(Spring/Summer).
- McKenzie-Mohr, D. (2013). Fostering Sustainable Behavior. *Sustain*(Spring/Summer).
- McKown, C. (2012). Social equity theory and racial-ethnic achievement gaps. *Child Development*, 84(4), 1120-1136.
- Meadows, D., Meadows, D., Randers, J., & III, W. W. B. (1972). *The Limits to Growth*: Universe Books.
- Mommaerts, V., Reynders, S., Boulet, J., Besard, L., Sterk, G., & Smaghe, G. (2010). Risk Assessment for side-effects of neonicotinoids against bumblebees with and without impairing foraging behavior. *Ecotoxicology*, 19, 207-215.
- Orthner, D. K., Jones-Sanpei, H., Akos, P., & Rose, R. A. (2013). Improving Middle School Engagement Through Career-Relevant Instruction in the Core Curriculum. *The Journal of Educational Research*, 106(1), 27-38.
- Oxfam.org. (2017, January 2017). An Economy for the 99% Retrieved from https://www.oxfam.org/sites/www.oxfam.org/files/file_attachments/bp-economy-for-99-percent-160117-sum-en.pdf
- Pedersen, S., & Liu, M. (2003). Teachers' Beliefs about Issues in the Implementation of a Student-Centered Learning Environment. *Educational Technology Research and Development*, 51(2), 57-76.
- PGC. (2009). *Partnership for a Green City Climate Action Report*. Retrieved from http://media.wix.com/ugd/83ad86_041c37fd3fc44471965835b7ee63c20a.pdf
- PGC. (2014). Strategic Plan. In: Partnership for a Green City.
- PGC. (2017). Home Retrieved from <http://bfryrear.wixsite.com/greencitypartnership>
- Poe, J. (2017). Redlining Louisville: The History of Race, Class, and Real Estate. Retrieved from

<https://lojic.maps.arcgis.com/apps/MapSeries/index.html?appid=e4d29907953c4094a17cb9ea8f8f89de>

- Promise, N. L. C. f. L. E. a. A. s. (2007). *College Learning for the New Global Century*. Retrieved from
- Ross, A. (2015, September 3, 2015). JCPS desegregation timeline. *Courier-Journal*. Retrieved from <http://www.courier-journal.com/story/news/education/2015/09/03/jcps-desegregation-timeline/71637432/>
- Ross, A. (2016, July 30, 2016). Gym Showcases JCPS and YMCA Partnership. *Courier-Journal*. Retrieved from <http://www.courier-journal.com/story/news/education/back-to-school/2016/07/30/gym-showcases-jcps-and-ymca-partnership/87454896/>
- Shannon, G. S., & Bylsma, P. (2006). Helping students finish school: Why students drop out and how to help them graduate. *Washington Office of Superintendent of Public Instruction*.
- Spada, M., Bierlaire, M., & Lielbling, T. M. (2005). Decision-Aiding Methodology for the School Bus Routing and Scheduling Problem. *Transportation Science*, 39(4), 477-490.
- Star, E. (2017). What your 1-100 Energy Star Score Means. Retrieved from <https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager/interpret-your-results/what>
- Steg, L., & Vlek, C. (2009). Encouraging Pro-Environmental Behaviour: An integrative review and research agenda. *Journal of Environmental Psychology*.
- Suisse, C. (November 2016). Global Wealth Data Book. Retrieved from <http://publications.credit-suisse.com/tasks/render/file/index.cfm?fileid=AD6F2B43-B17B-345E-E20A1A254A3E24A5>
- Turner, S. L. (2011). Student-Centered Instruction: Integrating the Learning Sciences to Support Elementary and Middle School Learners. *Preventing School Failure: Alternative Education for Children and Youth*, 55(3), 123-131.
- WCED. (1987). *Our Common Future*: Oxford University Press.

Appendix A- Protostar Technical Manual

<http://www.protostarmetrics.org/protopages/get-involved>

Planning, Administration and Engagement:

Coordination and Planning

Strategic Plans (PAE- 2 of PROTOSTARS Assessment)

Background Information:

For my Masters Thesis project I am trying to get a sense of the kind of planning JCPS is doing for sustainability, for the district as a whole.¹

1. **Have a Sustainability Plan?** Does JCPS currently have an overall sustainability plan, or other guiding vision, for the district that focuses on sustainability goals? **If NO, skip to #9.**

For clarification, if needed: A strategic plan is the premier guiding document for an institution. It shapes the institutions priorities and guides budgeting and policy making. Including sustainability at a high level in the plan signals an institution's commitment to sustainability and

¹ Definition (if clarification is needed): ***Sustainability*** is about being better environmental stewards, more efficiency and better management of economic resources, social justice (which means treating people fairly and providing democratic participation), and building healthy, resilient communities (Mog 2011).

may help infuse an ethic of environmental responsibility throughout the institution. (Protostar Technical manual).

- a. What year was the strategic plan or guiding document adopted?
 - b. Does the plan include the ***environmental dimensions*** of sustainability as a priority? What environmental goals does JCPS have?
 - c. Does the plan include the ***social dimensions*** of sustainability as a priority? What social goals does JCPS have to address sustainability?
 - d. Does the plan include the ***economic dimensions*** of sustainability as a priority? What economic goals does JCPS have to address sustainability?
2. **Significant Milestones?** Has JCPS reached any significant sustainability goals from the plan in the past few to several years?
 3. **Areas for Improvement?** Are there any areas that JCPS has selected to improve upon, or any new goals set for sustainability?
 4. **Barriers?** Are there any barriers, or challenges, that have made it difficult for JCPS to implement its sustainability plan? Please describe them (e.g., institutional, governmental, financial, etc.).

Stakeholder Involvement in Plan Development (PAE-4 of PROTOSTARS Assessment)

Next, I would like to get an idea of how input from faculty, staff and students was used to develop JCPS's sustainability plan.

5. How were the JCPS faculty involved in the development of the plan?
6. How were JCPS staff involved?
7. How were students involved?

8. **Barriers?** What barriers did JCPS encounter when involving faculty, staff, or students in developing its sustainability plans, if any?

Plan Development

Jump to here if the answer to Question 1 ABOVE is NO. Ask these questions only if JCPS does NOT have an overall sustainability plan, or district-wide plan.

9. **Current Activities?** How does JCPS currently deal with sustainability?
10. **Plan Development?** Is JCPS planning to develop an overall sustainability strategic plan for sustainability district-wide? Or does JCPS intend to start the process of developing such a plan?
- a. **If so**, what sort of planning goals does JCPS have in mind, and when might the plan be implemented?
11. **Barriers? If there is NO plan:** Are there any barriers, or challenges, that have made it difficult for JCPS to develop a strategic plan for sustainability? Please describe them (e.g., institutional, governmental, financial, etc.).

PAE-1 Sustainability Coordination (PAE-1)

****Note: Based on the responses to earlier questions, I may not need to ask all of these questions, because it may already be clear at that point that the answer is NO to some of the following.***

12. **District Sustainability Committee?** Does JCPS have a sustainability committee that focuses on sustainability broadly and covers the entire district? ***If NO, skip to #13.***
- a. Could you give me a brief overview of each committee's mission, responsibilities, and activities, and how those fit with JCPS's broader goals?

- b. Who are on the committee? Who could I contact to learn more information?
13. **Individual School Committees?** Are there any sustainability committees at individual schools within JCPS, and if so, do any of their activities stand out as particularly noteworthy?
14. **Sustainability Coordinator?** I see that JCPS has an Environmental Coordinator, Joseph Irwin. Is this environmental coordinator a Sustainability Coordinator for the JCPS district?
- a. What are the Environmental Coordinator’s main activities and responsibilities?
- b. How does the Environmental Coordinator fit in with JCPS’s larger goals for sustainability, and education in general?
15. **Sustainability Office?** Does JCPS have an office whose exclusive duties relate to sustainability within the district? **If NO, skip to #16.**
- a. What goals and responsibilities does the sustainability office have?
- b. What initiatives has the office undertaken? And, do any activities particularly stand out as noteworthy?
- c. Who could I contact to learn more about the office?
16. **Barriers?**
- a. **If there is NO Committee/Office/district Coordinator:**
- Does JCPS have any plans to create a sustainability committee/ office/coordinator?
 - Are there any barriers or challenges that have made it difficult for JCPS to create a committee/office/coordinator for the district, or could make it difficult?
- b. **If there IS a Committee, Office, or district Coordinator:**
- Has the Committee/Office/district Coordinator encountered barriers or challenges that make it difficult for them to carry out their duties and reach their goals?

Staff Professional Development in Sustainability (PAE-12)

17. **Training?** Does JCPS regularly hold trainings for employees regarding sustainable practices in the following areas? **If NO, then skip to #18.**
- a. What does that training involve?
 - b. How often are employees trained?
 - c. Coverage: Does this training include all administrative staff and faculty, as well as people such as custodians, food service, and building and grounds maintenance workers?
18. **Barriers?** Are there any barriers or challenges that may make it difficult for JCPS to provide this training on a regular basis?
19. **Future?** Does JCPS have any plans to increase the amount of training provided to faculty and staff regarding sustainable practices?
20. **Barriers?** What barriers, if any, do you anticipate regarding providing more training to employees on sustainable practices in the various departments?

Sustainability in New Employee Orientation (PAE-13)

21. **Orientation?** Are sustainability topics covered in New Employee Orientation? **If NO, then Skip to #22.**
- a. **Topics?** What sustainability topics are covered during New Employee Orientation?
 - b. **Importance?** How much importance is placed on sustainability for new employees, in comparison to other priorities that JCPS has?

22. **Barriers?** What barriers have you encountered to making sustainability a priority topic during New Employee Orientation?
23. **Future?** Does JCPS have any plans to increase the priority placed on sustainability in New Employee Orientation?
24. **Barriers?** What barriers, if any, do you anticipate regarding placing a higher priority on sustainability in New Employee Orientation?

Other Plans

Finally, I would like to understand more broadly what kinds of plans JCPS has for dealing with some important topics in sustainability, like curriculum development, purchasing, and transportation.

25. **Curriculum?** Overall, how is JCPS incorporating topics of sustainability in its curriculum to prepare students to deal with problems in sustainability?
26. **Purchasing?** How is JCPS incorporating sustainability in purchasing? This could include, but is not limited to, use of environmentally benign cleaning supplies purchase of paper with recycled content.
27. **Transportation?** Overall, how is JCPS addressing sustainability and greenhouse gas emissions in the area of transportation, particularly pupil transportation?
28. **Air/Climate?** Overall, how is JCPS addressing greenhouse gas emissions across the district? This could include, but is not limited to, HVAC systems, building and grounds maintenance and food service.
29. **Energy?** How is JCPS addressing energy efficiency as an aspect of sustainability?

Any other Information?

30. Thank you for your help today. As the superintendent [or equivalent] are there any other topics or information you think I should be aware of, or look into, for my Masters Project?

Appendix C Interview Questions Energy

Energy

Note: Questions that may be answered by first requesting existing records are highlighted in green.²

Background Information:

For my Masters Thesis project I am trying to get a sense of the kinds of things JCPS is doing to conserve energy and manage energy more sustainably, for the district as a whole.³ I will be asking about such topics as: the current energy management systems, renewable energy, and various methods JCPS may be using to conserve energy.

Energy Conservation Plan

31. **Energy Conservation Plan?** Does JCPS have an overall energy conservation plan, or other guiding vision, for the district that focuses on energy and sustainability goals? If so, please describe the key details of the plan (e.g., its goals, areas of coverage, and general timeframes). **If NO, skip to #5.**

² This topic involves some technical information that may already be available in records/reports that JCPS maintains. To save time, before conducting the interview with the appropriate administrator, we will ask if it is possible to access copies or summaries of those records, so that we do not need to ask about that information during the actual interview. This approach will shorten the interview and allow us to focus on questions that need to be answered in person.

³ Definition (if clarification is needed): **Sustainability** is about being better environmental stewards, more efficiency and better management of economic resources, social justice (which means treating people fairly and providing democratic participation), and building healthy, resilient communities (Mog 2011).

e. What year was the plan adopted?

f. Could I get a copy of the energy conservation plan (or vision)?

32. **Significant Milestones?** Has JCPS reached any significant sustainability goals from the plan in the past few to several years?
33. **Areas for Improvement?** Are there any areas that JCPS has selected to improve upon, or any new goals set for energy conservation and sustainability?
34. **Barriers?** Are there any barriers, or challenges, that have made it difficult for JCPS to implement its sustainability plan? Please describe them (e.g., institutional, governmental, financial, etc.).

Plan Development

If Question 1 ABOVE is NO, jump to here.

If Question 1 is YES, skip to #8.

35. **Current Activities?** If JCPS doesn't have an official district-plan for energy conservation, or sustainability, how does JCPS currently deal with energy conservation/sustainability?
36. **Plan Development?** Is JCPS planning to develop an overall plan for energy conservation and sustainability for the district? Or does JCPS intend to start the process of developing such a plan?
 - b. **If so**, what sort of planning goals does JCPS have in mind, and when might the plan be implemented?
37. **Barriers? If there is NO plan:** Are there any barriers, or challenges, that have made it difficult for JCPS to develop a strategic plan for energy conservation and sustainability? Please describe them (e.g., institutional, governmental, financial, etc.).

Building Energy Consumption (OP-7)

38. **Energy Use (Total)?** I am trying to get a sense of JCPS's overall energy use. What was the typical (average) building energy consumption (in MMBtu) for all JCPS buildings in the past 3 years? *If they do not have the information for all years, ask for the most recent year.*

a. About how many square feet of buildings is heated/cooled?

39. **Barriers**

a. **Measurement?** Have you encountered any barriers that make it difficult for JCPS to assess and record its total and individual building energy consumption? If so, please describe.

b. **Energy Reduction?** Have you encountered any barriers that make it difficult for JCPS to reduce its energy use? If so, please describe.

Energy Management Systems (OP-T2-17)

40. **Management System?** How does JCPS monitor its energy use for the entire district? Does JCPS use a centralized energy management system, which allows it to track energy consumption and performance of multiple buildings from a central location, or software? **If NO, skip to # 11.**

a. What kinds of energy conserving activities does the system do? For example, can it automatically shut down some systems when not in use, or adjust for low demand situations?

b. What percentage (of building square feet) is monitored by the system?

41. **Energy Use (Individual Buildings)?** I am also trying to understand how JCPS monitors and manages the energy use of individual buildings: how is that handled? ***OP-T2-18 Energy Metering***

- a. If meter systems are used, about how many (percentage-wise) of the buildings are metered? And, what kind of metering is done (e.g., energy and gas)?

42. Barriers?

- a. ***If JCPS DOES have a Central Energy Management System:*** Is there anything that needs to be improved with the central management system itself, or how it is implemented to improve energy conservation and sustainability?
- b. ***If JCPS does NOT have a Central Energy Management System:*** Are there any barriers that may make it difficult for JCPS to start using a central energy management system? If so, please describe.
- c. **Meters?** Have you encountered any barriers that may make it difficult for JCPS to install meters on all its buildings?

Energy Sources: Clean and Renewable Energy (OP-8)

- 43. Sources?** What energy sources does JCPS use to get its energy for buildings and facilities? This includes public sources, like powerplants, and your own private sources, like incinerators.
- a. What percentage of the total energy comes from each of the sources? For example, how much of JCPS' total energy comes from coal powerplants? Incinerators? Etc.
 - b. ***If not already clear from the first question:*** What percentage of the energy comes from clean or renewable energy sources, like solar, wind, biomass (digesters), etc?
- 44. On-site Production?** Does JCPS generate any of its own clean or renewable energy? If so, please describe.
- 45. Energy Credits?** Does JCPS purchase renewable energy credits (RECS), such as carbon offsets, located off of JCPS properties. For example, JCPS may sponsor wind generators in another state. If so, please describe.
- 46. Collaborative Production?** Does JCPS collaborate with any outside parties to produce (or develop) clean and renewable energy for its buildings?

47. **Cogeneration?** Does JCPS use any cogeneration technologies? This is when the byproducts of energy production or use, such as excess heat, is used to supplement additional energy production. For example, a building may be located next to a facility that generates waste heat that could be captured to help heat the building.
48. **Future?** Does JCPS have any plans to broaden its sources of clean and renewable energy sources? If so, please describe.
49. **Barriers?** Are there any barriers that you can see that may make it difficult for JCPS to increase its use of clean and renewable energy sources?

Use of Energy Conserving Technologies

Finally, I would like to get a sense of the kinds of energy conserving technologies JCPS uses or promotes at a district level, for example LED lighting, timers for temperature control.

50. **District-wide Technologies?** How does JCPS manage the use of energy saving technologies: does JCPS require or encourage the use of particular technologies as a standard policy? Or are these kinds of decisions left up to particular building managers on a case-by-case basis?

51. Types of Technologies Typically Used?

About how many buildings (what percentage) use the following technologies, fairly standardly:

- a. Timers for temperature control (OP-T2-13)
- b. Lighting sensors (OP-T2-14)
- c. LED lighting (OP-T2-15); other forms of energy-efficient lighting (e.g., florescent)
- d. Energy saving roof materials: vegetated, reflective, etc.

52. **Future?** Does JCPS have any plans to increase its use of energy conserving technologies?
53. **Barriers?** Are there any barriers that may make it difficult for JCPS to use these kinds of technologies throughout the district?

Any other Topics?

54. Thank you for your help today. As the Director of Property Management and Maintenance are there any other topics or information you think I should be aware of, or look into, for my Masters Project?

Appendix D- Interview Questions Air and Climate

Climate

Note: Questions that may be answered by first requesting existing records are highlighted in **green**.⁴

Greenhouse Gas Emissions Inventory (OP-4 of PROTOSTARS Assessment)

Background Information:

For my Masters Thesis project I am trying to get a sense of the kinds of things JCPS is doing to measure its output of climate-warming gases, for the district as a whole.⁵ I will be asking questions about an inventory of greenhouse gases and other sources of emissions.

⁴ This topic involves some technical information that may already be available in records/reports that JCPS maintains. To save time, before conducting the interview with the appropriate administrator, we will ask if it is possible to access copies or summaries of those records, so that we do not need to ask about that information during the actual interview. This approach will shorten the interview and allow us to focus on questions that need to be answered in person.

⁵ ***Definition:***

Scope 1 are referred to as Direct GHG, and are defined as 'emissions from sources that are owned or controlled by the organization'

Scope 2 are referred to as Energy Indirect GHG, and are defined as 'emissions from the consumption of purchased electricity, steam, or other sources of energy (e.g. chilled water) generated upstream from the organization'.

1. **Inventory?** Has JCPS done a greenhouse gas emissions inventory in the past three years? **If no, skip to #2.**

a. May I have a copy of the report?

b. Does the inventory include all Scope 1 and Scope 2 emissions?

c. Does the inventory account for emissions from air travel or commuting? This would include an attempt to account for the mileage accrued by both students and staff as a result of their travel to and from school or job site.

d. Does the inventory account for the greenhouse gases that are released with relation to the following areas?

- Purchase and shipping of supplies like books, paper, electronics, and cleaning supplies.
- Emissions from transporting solid waste to a landfill, composting facility or recycling center.
- Emissions from commuting to and from school or work by staff and students.
- Emissions related to transport of food.

e. Are there any other sources of emissions we may have missed? Please explain what they may be.

f. **Barriers?** What barriers, if any, have you encountered to completing a greenhouse gas inventory?

Scope 3 are referred to as Other Indirect GHG, and are defined as 'emissions that are a consequence of the operations of an organization, but are not directly owned or controlled by the organization'. Scope 3 includes a number of different sources of GHG including employee commuting, business travel, third-party distribution and logistics, production of purchased goods, emissions from the use of sold products, and several more.

<http://www.icomplisustainability.com/index.php/ask-the-expert/ghg-management/item/63-what-are-the-differences-between-scope-1-2-and-3-greenhouse-gas-emissions/63-what-are-the-differences-between-scope-1-2-and-3-greenhouse-gas-emissions>

Only ask #2 and 3 if the answer to #1 is NO.

2. **Future Plans?** Has JCPS considered conducting a Greenhouse Gas Emissions Inventory?
3. **Barriers?** What barriers, if any, do you anticipate with regard to completing a Greenhouse Gas Inventory?

Air Travel Emissions (OP-T2-1)

4. **Policy?** Does JCPS have policies in place to provide alternatives to air travel? These alternatives could include carpooling with employees of other districts, train travel or participation via electronic means (e.g. Skype). **If NO, continue. If YES, skip to #5.**
 - a. **Future Plans?** Have you considered developing a policy regarding this area?
 - b. **Barriers?** What barriers would you anticipate encountering if you tried to develop a policy regarding air travel emissions?

Only ask #5 and 6 if the answer to #4 is YES.

5. **May I have a copy of the policy?** If not available, please describe these policies.
6. **Barriers?** What barriers, if any, have you encountered that may make it difficult for JCPS to reduce emissions from air travel? (*e.g., institutional, governmental, financial, physical*)

Local Offsets Program (OP-T2-2)

7. **Policy?** Does JCPS have a local offsets program through which the district seeks to offset its greenhouse gas emissions by implementing projects that reduce GHG emissions in the local community? Such a program could include projects within the community to weatherize homes, plant trees or restore habitat. **If YES, skip to #8. If NO, stop at #7.**
 - a. **Future Plans?** Have you considered developing a policy for offsetting greenhouse gas emissions?

- b. **Barriers?** What barriers would you anticipate encountering if you tried to develop a policy for implementing local offsets?

8. **May I have a copy of the plan?**

9. **Projects?** What projects has the district or individual schools undertaken? What is the projected reduction in emissions from these projects?

10. **Barriers?** What barriers, if any, have you encountered that may make it difficult for JCPS to implement a program for offsetting emissions through local projects? (*e.g., institutional, governmental, financial, physical*)

Indoor Air Quality (OP-3)

11. **Space covered?** What percentage of building space is covered by an indoor air quality plan?

12. Does this include regular monitoring and a mechanism for reporting concerns?

Policy? **May I have a copy of the plan?** If it is not available, please explain it in general terms.

13. **Future Plans?** Does JCPS have any future plans for improving indoor air quality?

Barriers? What barriers have you encountered to maintaining air quality?

14. Are there some areas that are more difficult to maintain than others? Why

Any other Topics?

15. Thank you for your help today. As the director of property management are there any other topics or information you think I should be aware of, or look into, for my Masters Project?

Appendix E- Interview Questions Purchasing

Purchasing

Note: Questions that may be answered by first requesting existing records are highlighted in green.⁶

Background Information:

For my Masters Thesis project I am trying to get a sense of the kinds of things JCPS is doing to provide sustainable supplies and electronics for use throughout the district. I will be asking about purchasing decisions regarding: electronics, cleaning supplies, paper products and vendor selection.

Computer Purchasing (OP-10)

1. **Policy?** Does JCPS have a policy in place regarding the sustainability of computers purchased? This would include energy efficiency, recyclability and sustainable production methods. **If NO, skip to #3. Unknown, checking with Craig Garrison**
 - a. Briefly, what are the main goals and aspects of the policy? **May I have a copy of the policy?**
 - b. What steps are in place to ensure the policy is followed?
 - c. Percentage of Expenditures?** About how much (what percentage) of the computers purchased in the last three years (or most recent year) meet the policy's standards? Overall, about what percentage of computers used by JCPS adhere to the policy?
2. **Barriers?** What barriers, if any, have you encountered that make it difficult for JCPS to purchase computers that are more sustainable?

Only ask Questions 3 and 4 if the Answer to #1 is NO.

⁶ This topic involves some technical information that may already be available in records/reports that JCPS maintains. To save time, before conducting the interview with the appropriate administrator, we will ask if it is possible to access copies or summaries of those records, so that we do not need to ask about that information during the actual interview. This approach will shorten the interview and allow us to focus on questions that need to be answered in person.

3. **Future plans?** Does JCPS have any plans to develop a policy regarding sustainable computers purchasing?
4. **Future barriers?** What barriers do you anticipate, if any, if JCPS tried to purchase more sustainable computers?

Cleaning Products Purchasing (OP-11)

5. **Policy?** Does JCPS have a stated policy for purchasing cleaning products that are Green Seal or EcoLogo certified, or perhaps some other Green designation? **If NO, skip to #7. Policy follows Partnership**
 - a. Briefly, what are the main goals and aspects of the policy? **May I have a copy of the policy?**
 - b. What steps are in place to ensure the policy is followed?
 - c. **Expenditures?** **What percentage of expenditures for cleaning supplies was spent in the last three years on certified cleaning products?**
6. **Barriers?** What barriers, if any, have you encountered that make it difficult for JCPS to purchase green certified cleaning products?

Only ask Questions 7 and 8 if the Answer to #5 is NO.

7. **Future plans?** Does JCPS have any plans to develop a policy to purchase green cleaning products?
8. **Future barriers?** What barriers do you anticipate, if any, if JCPS tried to purchase more sustainable cleaning products?

Paper Purchasing (OP-12)

9. **Policy for Office Paper and Other Classroom uses?** Does JCPS have a policy for purchasing office paper and paper for other classroom uses with recycled content? **If NO, skip to #11.**
 - a. Briefly, what are the main goals and aspects of the policy? **May I have a copy of the policy?**
 - b. What steps are in place to ensure the policy is followed?

c. **Percentage of Expenditures?** About how much (what percentage) of the office and classroom paper purchased in the last three years (or most recent year) meet the policy's standards? Overall, about what percentage of paper use adheres to the policy?

10. **Barriers?** What barriers, if any, have you encountered that make it difficult for JCPS to purchase more sustainable paper?

Only ask Questions 11 and 12 if the Answer to #9 is NO.

11. **Future plans?** Does JCPS have any plans to develop a policy for more sustainable paper?

12. **Future barriers?** What barriers do you anticipate, if any, if JCPS tried to purchase more sustainable paper?

Vendor Code of Conduct (OP-13)

13. **Policy?** Does JCPS have a vendor code of conduct that sets expectations for all agents (contractors, equipment suppliers, food vendors etc.) about the social and environmental responsibilities of vendors with whom the district does business? **If No, skip to #15.**

a. Briefly, what are the main goals and aspects of the policy? **May I have a copy of the policy?**

b. What steps are in place to ensure the policy is followed?

14. **Barriers?** What barriers, if any, have you encountered that may make it difficult for JCPS to implement its code of conduct for vendors with whom JCPS does business?

Ask #15 and 16 only if the answer to #13 is NO.

15. **Future Plans?** Has JCPS considered developing a Vendor Code of Conduct?

16. **Future barriers?** What barriers do you anticipate, if any, if JCPS tried to develop and implement a Vendor Code of Conduct?

Historically Underutilized Businesses (OP-T2-23)

17. **Policy?** When purchasing supplies or services, does JCPS seek to support historically underutilized businesses⁷, minority-owned businesses or women-owned businesses? This support can come in the form of, but is not limited to, giving preference in Requests for Proposals or targeted outreach in the form of business recruiting fairs. **If NO skip to #18.**
- a. Briefly, what are the main goals and aspects of the policy? **May I have a copy of the policy?**
 - b. **How many (what percentage) of businesses that JCPS utilizes are Historically Underutilized?**
 - c. **Categories?** Which categories, if any, have been particularly hard to find suitable vendors in? (*e.g., institutional, governmental, financial, physical*)
 - d. **Barriers?** What barriers, if any, have you encountered that may make it difficult for JCPS to do business with Historically Underutilized Businesses? **Price**

Ask #18 and 19 only if the answer to #17 is NO.

18. **Future plans?** Has JCPS considered developing a policy to promote Historically Underutilized Businesses?
19. **Future barriers?** What barriers, if any, do you anticipate should you choose to develop such a policy?

Local Businesses (Op-T2-24)

20. **Policy?** Does JCPS give preference to local products and businesses in its purchasing decisions? **If YES, continue with a-b. If NO, skip to #29.**

⁷ Definition: ***Historically Underutilized Businesses*** is a designation granted by the Small Business Administration to businesses located within certain census tracts to help them gain access to federal contracts. Businesses may qualify for this designation if they are located in areas of low median household income or high unemployment and meet other qualifications.

- a. Briefly, what are the main goals and aspects of the policy? **May I have a copy of this policy?**
 - b. Are there any needs the district has difficulty filling locally?
21. **What products and services does JCPS get from local business providers?**
22. **How many (what percentage) of businesses that JCPS utilizes are local?**
23. **Barriers?** What barriers, if any, have you encountered that may make it difficult for JCPS to give preference to local products and businesses?

Ask #24 and 25 only if the answer to #20 is NO.

24. **Future Plans?** Has JCPS considered developing a policy to give preference to local businesses?
25. **Future barriers?** What barriers do you anticipate, if any, if JCPS tried to give preference to local businesses?

Any other Topics?

26. Thank you for your help today. As the director of purchasing are there any other topics or information you think I should be aware of, or look into, for my Masters Project?

Procurement regulations set by state statute, KRS 45A494, due to be updated this year, will include reciprocal preference. His decisions are driven by cost, secondary to district policy.

Appendix F- Interview Questions Transportation

Transportation

Note: Questions that may be answered by first requesting existing records are highlighted in green.⁸

Background Information:

For my Masters Thesis project I am trying to get a sense of the kinds of things JCPS is doing to minimize greenhouse gas emissions and pollution by vehicles. This includes miles driven in JCPS vehicles as well as miles driven by students, their parents and employees to commute to and from schools or job sites. We will also be looking at facilities for bicycles and support for students learning to ride.

Campus Fleet (OP-14)

1. General Fleet. Aside from school buses, how many vehicles does the district have in the following categories:

- Gasoline-hybrid vehicles
- 100% electric vehicles
- Vehicles fueled with 100% compressed natural gas
- Hydrogen-fueled vehicles
- Vehicles that are fueled with B20 or higher biofuel for more than 6 months of the year
- Vehicles that are fueled with E85 or higher ethanol for more than 6 months of the year

⁸ This topic involves some technical information that may already be available in records/reports that JCPS maintains. To save time, before conducting the interview with the appropriate administrator, we will ask if it is possible to access copies or summaries of those records, so that we do not need to ask about that information during the actual interview. This approach will shorten the interview and allow us to focus on questions that need to be answered in person.

2. Excluding school buses, on average, how many miles are put on fleet vehicles each year (past 3 years)?

3. **School Bus Fleet.** How many buses are in the district fleet?

4. How many of those are hybrid gas/electric? What hybrid system is used?

5. How many miles do school buses travel each year (3 year average)?

6. **Fuels?** Tell me about the fuels used in the buses.

- How many buses are fueled with gasoline?
- How many with diesel?
- How does the fuel mix vary with the seasons?

7. How many gallons of fuel were used in the buses, on average, each year (past 3 years)?

8. **Number of Students?** How many students were transported to school on district buses each day, on average (past 3 years)?

9. **Mileage?** How many miles did the buses travel, on average, each year (past 3 years)?

10. How many miles are put on these buses before they are retired?

11. **Engine Comparisons?** How does fuel mileage vary among the different types of engines?

12. Given fuel mileage and maintenance needs, which style of engine do you find preferable and why?

13. **Trends?** Do you notice any trends in vehicle use?

- Greater or fewer miles driven each year?
- Greater or less fuel mileage?

14. **Future Plans?** What plans, if any, exist to increase the fuel mileage of the buses or reduce the number of miles driven?

15. **Barriers (fuel efficiency)?** What barriers, if any, have you encountered that may make it difficult for JCPS to purchase more fuel-efficient vehicles?

16. **Barriers (total mileage)?** What barriers, if any, have you encountered regarding reducing the total number of miles driven each year? (*e.g., institutional, governmental, financial, physical*)

Employee and Student Commute Modal Split (OP-15, OP-16)

17. **Data?** Do you have data on the percentage of students and/or employees who travel to school or job sites in any of the following manners?

- Alone (single occupancy vehicle)
- Carpool (multiple occupancy vehicle)
- Bus (mass transit)
- Walking
- Bicycle

a. If yes, may I please have a copy of that data?

18. **Future Plans?** What plans, if any, has JCPS considered to reduce greenhouse gas emissions in relation to staff and student commuting?

19. **Barriers?** What barriers, if any, have you encountered that may make it difficult for JCPS to encourage more sustainable modes of employee and student transportation? (*e.g., institutional, governmental, financial, physical*)

Facilities for Bicyclists (OP-T2-26)

20. **Bicycle storage?** Does JCPS have facilities anywhere in the district with indoor, secure bike storage, shower facilities and lockers for bicycle commuters? **If no, skip to #21.**
- a. Please describe the facilities, including locations and capacities.
21. **Bike racks?** Do all schools have bike racks available?
22. How many of those racks are located in a covered area near the building?
23. **Future plans?** Does JCPS have any plans to install more bike racks and other facilities for bicycle commuters?
24. **Barriers?** What barriers, if any, have you encountered that may make it difficult for JCPS to provide facilities for bicyclists? (*e.g., institutional, governmental, financial, physical*)

Bicycle Plan (OP-T2-27)

25. **Plan?** Has JCPS developed a plan to encourage bicycling as a form of basic transportation? **If NO, skip to #26.**
- a. **May I have a copy of the plan?** If not available, please describe the plan.
26. What barriers, if any, have you encountered that make it difficult for JCPS to develop a district-wide bicycle plan? (*e.g., institutional, governmental, financial, physical*)
27. **Safe Cycling?** How many schools provide opportunities for students to learn safe bicycling habits?
- a. **How many students are served by these programs each year?**
28. **Helmets and locks?** Are there opportunities for students to get helmets and bike locks free of charge or at a discount?
29. **Maintenance?** Are there programs to teach students how to fix and maintain their bicycles?

30. **Donations?** Is there a facility where the public can donate used bikes to be refurbished and given to students for transportation?
31. **Barriers?** What barriers do you anticipate, if any, if JCPS tried encourage bicycling as a form of basic transportation?

Mass Transit (OP-T2-28)

32. **Bus passes?** Does JCPS offer free or reduced price transit passes for students or employees? **If no, skip to #34.**
33. **May I have a copy of the program?** If it is unavailable, please describe the program(s).
- Who is the program available to?
 - Who uses it the most?
 - If it is a discount program, how much is the discount?
 - What kind of feedback have you gotten from the participants?
34. **Future Plans?** Has the district considered providing this program?
35. **Barriers?** What barriers, if any, have you encountered that may make it difficult for JCPS to offer free or reduced price transit passes? (*e.g., institutional, governmental, financial, physical*)

Prohibiting Idling (OP-T2-35)

36. **Policy?** Does JCPS currently have a No Idling policy? **If NO, skip to #37.**
- Please describe the no-idling policy.
 - Who is covered under the policy?
 - What mechanisms are in place to ensure the policy is followed?

- How is the policy implemented with district vehicles?
 - How is it implemented with members of the community (particularly parents/guardians waiting in line for students after school)?
37. **Barriers?** Have you encountered any barriers that may make it difficult for JCPS to adopt or enforce a policy to prevent idling?
38. **Future Plans?** Does JCPS have any future plans for reducing idling near schools?

Carpool Matching (OP-T2-31)

39. **Program?** Does JCPS offer a carpool/vanpool matching program? Such a program would allow employees and parents to list their needs and availability on a website or other forum and find other people with similar needs to carpool together. **If NO, skip #42.**
- a. Please describe the program.
40. **Other Options?** Does JCPS offer employees the option to ride school buses as transportation to various schools across the district?
41. **Barriers?** What barriers, if any, have you encountered that may make it difficult for JCPS to offer a carpool matching program for its employees? (*e.g., institutional, governmental, financial, physical*)
42. **Future Barriers?** What barriers do you anticipate, if any, if JCPS tried to develop a carpool matching program?

Any other topics?

43. Thank you for your help today. As the director of transportation, are there any other topics or information you think I should be aware of, or look into, for my Masters Project?

Appendix G- Interview Questions Curriculum, Professional Development and Community Engagement

Curriculum:

Incentives for Developing Courses, Campus as a Living Laboratory

Note: Questions that may be answered by first requesting existing records are highlighted in green.⁹

Incentives for Developing Sustainability Subjects/Courses

(ED-11, PROTOSTARS Assessment)

Background Information:

For my Masters Thesis project I am trying to get a sense of the kind of incentives teachers have for developing sustainability related courses. I am also interested in the kinds of community engagement activities students may be engaged in for sustainability.

EDUCATORS

⁹ This topic involves some technical information that may already be available in records/reports that JCPS maintains. To save time, before conducting the interview with the appropriate administrator, we will ask if it is possible to access copies or summaries of those records, so that we do not need to ask about that information during the actual interview. This approach will shorten the interview and allow us to focus on questions that need to be answered in person.

55. **Incentives?** What kinds of incentives or programs, if any, does JCPS have to encourage educators to integrate sustainability into already existing courses, or develop new sustainability related courses?
56. **Learning Communities?** Are there any Professional Learning Communities within JCPS that educators can participate in to learn more about sustainability and environmental education? **If NO, skip to #3.**

- a. What kinds of groups, and what are their goals and activities?
- b. Who can I contact to learn more?

57. **Barriers?**

- a. Have you encountered any barriers that may make it difficult for JCPS to provide *incentives or professional support* for sustainability education? If so, what are they?
- b. What about *learning communities*?

58. **Future?** As far as you know, does JCPS have any plans to improve, or develop, its support for sustainability education or teacher training?

STUDENTS

Next I would like to learn about student engagement and their preparation for sustainability.

Public Engagement

Community Service Participation (PAE-20-21)

59. **Participation?** During the past 3 years, about how many students typically get involved in community service each year? Roughly what percentage?

- a. About how many hours would that total in a typical year?

- b. What types of organizations do students typically volunteer with? And, what kinds of projects do they typically do?
- c. About how many projects *focused on sustainability*, or issues related to sustainability? And, do any in particular stand out as noteworthy?

Graduation Pledge (PAE-T2-10)

60. **Pledge?** Has JCPS developed a graduation pledge, in which students pledge to consider their social, environmental, and economic responsibilities for sustainability in future jobs and other decisions? **If NO, skip to #7.**

a. **Program?** Please describe the Graduation pledge program.

b. **May I have a copy of the pledge?**

c. **Barriers and Feedback?** Have you encountered any barriers that may be making it difficult to implement the pledge program? And, what feedback have you gotten from faculty, graduates or their families regarding the pledge?

Skip #7 if #6 is YES.

61. **Development?** Does JCPS have plans to develop such a pledge? If so, what might that pledge involve, and when might it be implemented?

a. **Barriers?** Do you anticipate any barriers to establishing a pledge program?

COLLABORATIONS

Community Sustainability Partnerships (PAE-18)

62. **Partnerships?** Does JCPS have formal partnerships with other, non-academic, organizations in the city to advance sustainability? **If NO, Skip to #9.**

a. Could you please briefly describe these partnerships and their missions? I can follow up with additional research later to identify details.

Intercampus Collaboration on Sustainability (PAE-19)

63. **Collaboration?** Does JCPS work with other schools or school districts in the region to advance sustainability? If so, what are the general goals of such collaborations? **If NO, skip to # 10.**

a. Could you please briefly describe these partnerships and their missions? I can follow up with additional research later to identify details.

- b. Are there any examples of collaboration that particularly stand out?
64. **Between Schools?** Are there opportunities for collaboration between schools with regard to sustainability? This could include collaboration between student groups as well as faculty and staff. **If NONE, skip to # 11.**
- a. Please describe some of these collaborations, particularly between student groups.
65. **Affiliations?** What local, state, regional or national sustainability organizations is JCPS affiliated with? **If NONE, skip to # 12.**
66. **Presentations?** Have JCPS employees presented papers, guides or other resources at professional conferences or for public distribution to present their sustainability work to a wider audience? Add **If NO, skip to # 13.**
- a. Have students and/or staff presented the results of their projects to groups outside the district?
 - b. Which projects stand out as exceptional?
67. Are there any other ways we haven't discussed where JCPS collaborates with other organizations to advance sustainability?
68. **Barriers?**
- a. Are you aware of any barriers to collaboration between JCPS and other organizations?
 - b. Are you aware of any barriers to collaboration between districts?
 - c. Are you aware of any barriers to collaboration between schools within the district?
 - d. Are you aware of any barriers to JCPS participating in state, regional or national sustainability organizations?
 - e. Are you aware of any barriers to JCPS staff and students presenting their work at conferences or other venues?
 - f. Barriers to developing sustainability-themed course-
 - g.

Any other Topics?

69. Thank you for your help today. As the director for curriculum and community engagement are there any other topics or information you think I should be aware of, or look into, for my Masters Project?

Planning and Administration Data Request

PAE-1 Sustainability Coordination

Sustainability committee

Charter/mission statement for JCPS's district-wide Sustainability Committee

Names, roles or job titles (e.g., staff, faculty, student) and affiliations (e.g., school) within the district of the members of the committee?

Number of sustainability committees at individual schools within JCPS

Sustainability Coordinator

Job description for the JCPS Sustainability Coordinator

PAE-2 Strategic Plan

Definition: Sustainability is about being better environmental stewards, more efficiency and better management of economic resources, social justice (which means treating people fairly and providing democratic participation), and building healthy, resilient communities (Mog 2011).

Definition: A strategic plan is the premier guiding document for an institution. It shapes the institutions priorities and guides budgeting and policy making. Including sustainability at a high level in the plan signals an institution's commitment to sustainability and may

help infuse an ethic of environmental responsibility throughout the institution. (Protostar Technical manual).

JCPS's Strategic Plan with the date of its adoption and most recent update

PAE-4 Sustainability Plan

JCPS's Sustainability Plan

PAE-3 Physical Campus Plan

Definition: An institution's physical campus plan can be considered a master plan for the development and maintenance of the institution's physical structures. Incorporating sustainability in the physical campus plan ensures that it is taken into consideration when making decisions regarding the development of buildings and grounds.

JCPS's Physical Campus Plan

PAE-5 Climate Action Plan

JCPS's Climate Action Plan

Appendix I- Archival Data Energy

Energy Management Data Request

OP-T2-17 Energy Management Systems

Percentage of district buildings (in square feet) monitored with an energy management system

Name or description of the District's centralized energy management system

OP-T2-18 Energy Metering

Percentage (in square feet) of buildings with energy metering

Number of buildings on individual meters

Percentage of all buildings on individual meters

OP-7 Building Energy Consumption

Total building energy consumption (in MMBtu) for all JCPS buildings last year (most recent data available)

Total square feet the district heated and cooled during that same time period

OP-8 Clean and Renewable Energy

Total number of watts produced from renewable sources throughout the district

Percentage of total energy needs provided from renewable sources

OP-T2-13 Timers for Temperature Control

Number of buildings with timers for temperature control

Percentage of buildings (by square foot) with these systems for temperature control

OP-T2-14 Lighting Sensors

Number of buildings with lighting sensors

Percentage of building space (square feet) with lighting sensors

OP-T2-15 LED Lighting

Percentage (square feet) of indoor space lit with LEDs

Number of buildings with LED lighting currently

Percentage of outdoor areas lit with LEDs

Other Types of Energy Efficient Lighting

Percentage of buildings lit with efficient, non-LED lighting (such as fluorescent, automatic daylight shutoff, occupancy sensors or other energy-saving features)

Op-T2-16 Vending Machine Sensors

Percentage of vending machines with occupancy sensors

Percentage of vending machines that are high efficiency

Appendix J- Archival Data Air and Climate

Data Request – Air Quality

OP-T2-35 Prohibiting Idling

JCPS's No Idle Policy

OP-4 Greenhouse Gas Emissions Inventory

JCPS's Greenhouse Gas Emissions Inventory and any Updates

OP-3 Indoor Air Quality

Indoor Air Quality Plan

Number of square feet covered by indoor air quality guidelines (such a plan would include, but is not limited to regular inspection and replacement of air filters, an inventory of toxic chemicals and plans for remediation of mold)

Appendix K- Archival Data Purchasing

Purchasing Data Request

OP-T2-39 Materials Online

A copy of the district's policy regarding the publishing of catalogs, course schedules and directories on-line instead of on paper

OP-T2-10 Recycled Content Napkins

Recycled Content Toilet Paper and Paper Towels

A copy of the district policy regarding the use of recycled content napkins, toilet paper and paper towels

OP-10 Computer Purchasing

A copy of the policy JCPS uses to determine which computers and other electronic devices to buy

Total dollar amount JCPS spent last year on desktop and laptop computers and monitors

OP-11 Cleaning Products Purchasing

Total expenditure last year for all cleaning products combined

Total amount spent in the last year on Green Seal and/or EcoLogo cleaning products?

Total amount spent on cleaning supplies with other certifications

OP-12 Office Paper Purchasing

A copy of the District's policy on the purchase of copy paper

District's total expenditure on office paper last year

Percentage that was recycled-content paper

Recycled Content Paper for Other Uses

Total amount spent last year on recycled paper products for other classroom uses

District's total expenditure for paper for other classroom uses

OP-13 Vendor Code of Conduct

A copy of the District's Vendor Code of Conduct that sets expectations for all agents (contractors, equipment suppliers, food vendors etc.) about the social and environmental responsibilities of vendors with whom the district does business

OP-T2-23 Historically Underutilized Businesses

Definition: Historically Underutilized Businesses is a designation granted by the Small Business Administration to businesses located within certain census tracts to help them gain access to federal contracts. Businesses may qualify for this designation if they are located in areas of low median household income or high unemployment and meet other qualifications.

A copy of JCPS's policy to support historically underutilized businesses, minority-owned businesses or women-owned businesses (this support can come in the form of, but is not limited to, giving preference in Requests for Proposals or targeted outreach in the form of business recruiting fairs)

Percentage of businesses that JCPS utilizes are historically underutilized?

Op-T2-24 Local Businesses

A copy of the JCPS policy giving preference to locally owned businesses

Percentage of businesses that JCPS utilizes that are local

Appendix L- Archival Data Transportation

Transportation Data Request

OP-14 Campus Fleet

Total number of vehicles in the fleet, including all of those below

Gasoline-hybrid, non-plug-in hybrid vehicles

Diesel-electric, non-plug-in hybrid vehicles

Plug-in hybrid vehicles

100% electric vehicles

Vehicles fueled with 100% compressed natural gas

Hydrogen-fueled vehicles

Vehicles that are fueled with B20 or higher biofuel for more than 6 months of the year

Vehicles that are fueled with E85 or higher ethanol for more than 6 months of the year

Total number of vehicles overall

Excluding school buses, on average, number of miles put on the fleet vehicles each year (past 3 years)

Number of buses in the district fleet

Number of miles buses traveled last year

Number of students transported to school on district buses last year

Number of gallons of fuel used in buses last year

Percentage of buses diesel-powered

Percentage of buses gasoline powered

Percentage of buses hybrid gas-electric

OP-15, OP-16 Employee (and Student) Commute Modal Split

Percentage of **employees** travel to and from school by:

Alone (single occupancy vehicle)

Carpool (multiple occupancy vehicle)

Bus (mass transit)

Walking

Bicycle

Percentage of **students** travel to and from school by:

Alone (single occupancy vehicle)

Carpool (multiple occupancy vehicle)

Bus (mass transit)

Walking

Bicycle

Appendix M- Archival Data Curriculum, Professional Development and Community Engagement

Curriculum and Professional Development Data Request

ED-T2-2 Organic Garden

Total number of schools with organic gardens

ED-T2-1 Student Groups

Total number of schools with active student groups focused on sustainability or environmental education

PAE-18 Community Sustainability Partnerships, PAE-19 Intercampus Collaboration on Sustainability

List of any collaborations JCPS currently has in place with outside organizations to advance sustainability within the district (this could include locally, regionally and nationwide and may include national organizations like the North American Association for Environmental Education (NAAEE) or the National Energy Education Development Program (NEED))

PAE-12 Staff Professional Development in Sustainability

Number of professional development opportunities for teachers to develop proficiency in the teaching of sustainability or environmental education

Number of professional development opportunities for teachers to develop proficiency in teaching with social justice or economic justice in mind

The number of professional learning communities or other groups that focus on any of the three areas of sustainability (environment, social justice or economics) and the schools involved in each group.

Sustainability Curriculum

List of any courses offered at the high school and middle school level that focus on topics of sustainability (these can include but are not limited to AP Environmental Science, classes that focus on economics or social justice issues, the experiences of immigrants and minorities in American history and the intensive study of other cultures and religions around the world)

PAE-20 Community Service Participation

Total number of students engaged in community service for the 2015-2016 school year

PAE-21 Community Service Hours

Total number of community service hours for the 2015-2016 school year

CURRICULUM VITAE

Elizabeth Ann (Betsy) Ruhe

Objective

To be part of an organization focused on minimizing its environmental footprint and improving its triple bottom line: environment, social justice and economic equality

Education

Formal

2016-17 University of Louisville Graduate Research Fellowship in Sustainability with a Focus on Education

2009-2010 University of Louisville rank 1 with a Focus on Environmental Education

1997-1999 Bellarmine University Master of Arts in Teaching with Certification in Learning and Behavior Disorders K-12

1981-1985 University of Louisville Bachelor of Arts in Psychology, Bachelor of Science in Physical Education

Informal

2016-2017 Community Engagement Academy

2009 Foundation for Teaching Economics – Economics and the Environment

2014 Center for Neighborhoods- Neighborhood Institute

2013 Center for Neighborhoods- Green Institute

Skills

Educator

Community Organizer

Personal

Birth Date: 01.23.1962

Birth Place: Louisville, Kentucky

Contact

4553 Southern Parkway

Louisville, Ky. 40214

502-445-4474

bruhe@bellsouth.net

earuhe01@louisville.edu

betsy.ruhe@jefferson.kyschools.us

volunteer

2014-2016 Beechmont Neighborhood Association Board of Directors

2015-Vice-President, Beechmont Neighborhood Association Board of Directors

2015-present Founder and President- Orchards of Beechmont

2014-present Founder- Philips Lane Walkability Group