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The Role of the Community College System in Fostering Sustainable Development and Entrepreneurship in Appalachian Kentucky

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Executive Summary

Appalachian Kentucky is a region rich with cultural heritage, natural resources, and scenic beauty. Yet, the majority of the 55 counties that comprise this region fall within the lowest 10% of American counties by income level, and the area's average per capita market income is only $16,923, contributing to a 24.8 percent poverty rate (ARC, "County", 2014).

In November 2013, the National Association for Community College Entrepreneurship (NACCE) teamed with the Appalachian Regional Commission in November 2013 to promote community colleges as a mechanism to stimulate sustainable economic development. Central to their strategy was a focus on entrepreneurship as a driver of socio-economic growth (NAACE Partnerships, 2013).

During the spring of 2014, the Kentucky Community and Technical College System (KCTCS) engaged Columbia University's Workshop in Applied Earth Systems Policy Analysis graduate students to identify infrastructure, opportunities, and resources that could embrace sustainability and entrepreneurship, emphasizing the cultural fit with the people and resources of Appalachian Kentucky. KCTCS is deeply committed to the people of eastern Kentucky, with the mission to improve the quality of life of the Commonwealth's citizens by offering a range of degree programs, certificates, workplace training, and community outreach programs (KCTCS, June 20 2012). The system's administration recognizes that, despite the economic hardship resulting primarily from the loss of manufacturing and coal-related jobs, given access to capital and appropriate education and training, the strong human capital and plentiful resources within Appalachian Kentucky can allow this region to grow and develop.

This report is the culmination of an intensive three-month engagement between leaders at KCTCS and a Workshop Team from within Columbia University's Master of Public Administration in Environmental Science and Policy Program. This report includes the chief findings and recommendations generated by the Workshop Team generated during this, prepared at the request of Dr. George Edwards, President of Big Sandy Community College, and Ms. Billie Hardin, Director of Sustainability for KCTCS. President Edwards and Ms. Hardin commissioned this Workshop project on behalf of their colleagues and the people of Appalachia they wish to serve.

The Team's findings and recommendations are as follows:

- The Team identifies sustainable agriculture and environmental remediation as compelling industries through which KCTCS can encourage sustainable development through entrepreneurship.

- The Team proposes strengthening curriculum, for degrees, certificates and workforce training, in each identified sector.

- The Team recommends that KCTCS develop overarching initiatives to connect all programs

related to sustainable development and entrepreneurship, maximizing the effectiveness of its own resources as well as those available to the community through external sources. Such initiatives will support and spread best practices, improve access to capital, help initiate and develop relevant research, and create a centralizing virtual and physical platform for interested stakeholders. In order to improve the system's capacities to support sustainable development and entrepreneurship, regardless of the sector or industry, the Team recommends that the KCTCS administration:

- Establish the Institute for Sustainable Development,
- Establish the KCTCS Business Incubator,
- Launch a campaign to communicate culturally appropriate messages of sustainability and entrepreneurship at KCTCS and in local communities.

- The Team recommends that KCTCS seek out partnerships to help further define and build the reality of sustainable economic development in the 21st Century. Toward this end, we suggest that KCTCS continue to work with the Earth Institute at Columbia University on innovative program development and effective implementation for the betterment of the lives of people in Kentucky.

All of these recommendations build upon the significant resources that already exist in eastern Kentucky to support sustainable economic development. KCTCS can play a pivotal role in bolstering this growth through its unique duty to train the next generation of Kentucky's learners, leaders, and entrepreneurs.

The Workshop Team is grateful to the clients, Dr. Edwards and Ms. Hardin, for providing the opportunity to contribute to their work. We are also grateful to our Faculty Advisor, Dr. Nancy Degnan. Her expertise, guidance, encouragement and critical feedback have been essential to our research and the recommendations in this report.

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I. Introduction

Appalachian Kentucky is a region rich in cultural heritage and natural beauty. Yet dependence on a single industry, coal, and a slow rate of economic growth have prevented communities in the region from achieving the levels of prosperity and well-being realized in most other regions in America (REAL and CREC, February 2014).

The National Association for Community College Entrepreneurship (NACCE) and the Appalachian Regional Commission (ARC) have together identified **community colleges** as key *vehicles* for economic growth, and **entrepreneurship** and **sustainable development** as the *drivers* for such growth in distressed Appalachian communities. In order to stimulate economic growth in Appalachian Kentucky through entrepreneurship and sustainable development, NAACE and ARC created a joint partnership in November 2013 to realize this potential within Appalachian community colleges. The partnership consists of five initiatives, the "Presidents for Entrepreneurship Pledge," a Fellows Program, a Regional Summit Series, online training, and an annual conference (NAACE Partnerships, 2013).

The Kentucky Community and Technical College System (KCTCS) is a collection of public higher education institutions that provides degree programs, certificates, workplace training, and community outreach programs. It aims to support a culture of sustainability that preserves the environment and enriches local communities within the state (KCTCS, June 20 2012). The KCTCS administrators most involved with the partnership between NAACE and ARC include KCTCS Chancellor Jay Box, KCTCS Vice President Ken Walker, Big Sandy Community and Technical College President George Edwards, and KCTCS Sustainability Project Manager Billie Hardin. Community colleges within KCTCS targeted as grant recipients under this partnership initiative include Big Sandy, Elizabethtown, Hazard, Maysville, and Somerset (NACCE Partnerships, 2013). The NACCE designated Griffin Cottle as the Appalachian Entrepreneurship Fellow, to work with the individual colleges in identifying current entrepreneurial initiatives, matching resources to their needs, and creating a sustainable plan to support small businesses (NACCE Partnerships, 2013).

While Mr. Cottle's tasks center around NACCE goals and responsibilities, KCTCS Sustainability Project Manager Billie Hardin and Big Sandy President George Edwards engaged a team of ten graduate students from Columbia University participating in the Workshop in Applied Earth Systems Policy. This Workshop Team has consulted with KCTCS to assist on its portion of the

NACCE/ARC partnership. The KCTCS leadership also requested that the Workshop Team further include Ashland and Southeast Kentucky in their research.

II. Methods of Research

A. The Research Scope

The KCTCS administration requested that the Columbia University Team address the following six key areas in order for KCTCS to:

i. Help define and provide an infrastructure for sustainable education, research, development, and access to capital for small businesses in their communities;
ii. Encourage communities and economies to embrace and entrepreneurial culture;
iii. Identify small business support models based on community fit;
iv. Help build infrastructure, community assets, and resiliency;
v. Advance professional development modules for faculty and staff for the benefit of sustainable economic development; and,
vi. Suggest or identify specialized training for business, industry, and community stakeholders.

B. The Research Process

The KCTCS leadership requested a multifaceted analysis of its system capacities and community needs to inform recommendations particular to accelerating sustainable economic development in Appalachian Kentucky. The administration's requests identified several potential areas for research with respect to their vision for the role of the college system in community transformation. The Workshop Team distilled essential themes from the client proposal to serve as a high level guide in understanding the goals for this research report.

Figure 1 illustrates the Team's process for grasping the critical components of KCTCS' requests. In each sub-request, the client underscored certain facets of sustainable economic development and/or entrepreneurship that the KCTCS leadership believes to be critical to informing successful recommendations. However, the administration has been uncertain as to how to translate these somewhat abstract, nebulous principles into practical initiatives that can be delivered to Kentucky communities. The KCTCS leadership tasked the Workshop Team with identifying the particular KCTCS resources, or "gears," that the community college system should develop to provide the colleges the capacity to transform these abstract ideas into deliverable outcomes. All intended outcomes must build upon one another to support sustainable economic development and entrepreneurship in a way that will facilitate positive growth in the community.

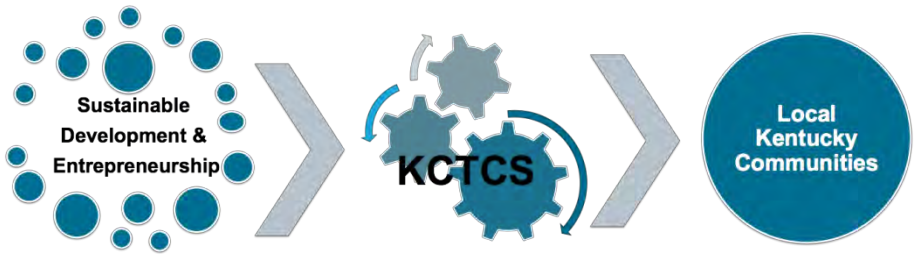

***Figure 1**. Client Request Framework*

In order to understand viable directions for that growth, the Workshop Team first conducted extensive theoretical, economic, and policy research to understand the communities surrounding the target KCTCS colleges. The Team then reviewed the curricular and extracurricular offerings of KCTCS, and the resources available at target colleges, in order to understand the current capacities of the educational system as well as areas for potential growth. Billie Hardin helped to guide this process and offered feedback concerning the research itself as well as the direction of the inquiry.

This process allowed the Workshop Team to identify promising sectors with opportunities for sustainable economic development and entrepreneurship in eastern Kentucky, and the potential barriers to their growth. The Team identified sustainable agriculture and environmental remediation and the likely challenges to their integration as the most conducive economic sectors. The next step was to match the particular capacities and resources of KCTCS with the potential to help communities overcome identified barriers, under three broad categories -- **network**, **education**, and **infrastructure**. This helped to inform the development of recommendations, the "gears" in Figure 1, which will allow the community colleges to integrate sustainable development and entrepreneurship in local environments. Each recommendation builds upon and enhances KCTCS network, education, and or infrastructure capacities in order to help overcome barriers to economic growth.

C. The Resulting Product

The Team conducted economic and educational strategy analysis before arriving at the recommendations detailed in this report. The intention of these recommendations is to build upon eastern Kentucky's strengths, and utilize the many resources and capacities of KCTCS, producing regionally appropriate and locally generated solutions to economic challenges.

The recommendations followed the sector-level research mentioned above, resulting in a comprehensive framework to promote sustainable economic development and entrepreneurship within the sectors of sustainable agriculture and environmental remediation. Each set of recommendations for the sectors draws upon one or more of the identified strengths of KCTCS to overcome barriers to the development of these promising industries.

The Team embedded the sector specific recommendations within a framework that also supports recommendations for KCTCS *as a system*, and how it can use its strengths to support a culture of sustainable development and entrepreneurship regardless of the sector. This culture will form the foundation for the success of the two specific sectors as well as any future path of sustainable development identified by the state. Figure 2 illustrates the logic of this recommendation framework. Recommendations in each sector enhance the general capacities of KCTCS in education, network and infrastructure by targeting that capacity in a specific field. System-wide recommendations offer over-arching initiatives to bolster the efforts of KCTCS as a system in delivering sustainable development and entrepreneurship.

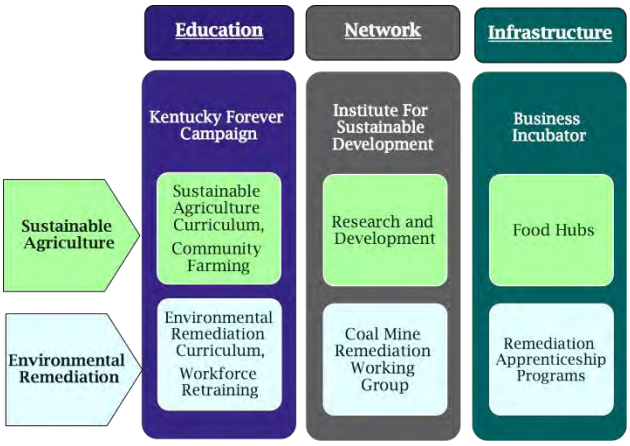

***Figure 2**. Recommendations Framework Overview*

III. The Context - Appalachian Kentucky and the Community College System

A. Appalachian Kentucky and the Community College System

The Appalachian region of the United States stretches from southern New York to northeastern Mississippi, encompassing 420 counties in 13 states. As of the 2010 census, 25 million people lived in Appalachia. Appalachia faces significant economic challenges, due, in large part, to its geographic isolation and historic challenges in connecting citizens with quality education, public health, and basic infrastructure. During the mid 1960's, almost one-third of all Appalachians lived below the poverty line, a reality that helped contribute to the launch of the War on Poverty (ARC, March 2013). Concerted federal and state efforts to improve the wellbeing of Appalachian citizens helped to reduce the poverty rate considerably since that time; as of 2013, the ARC reported the poverty rate of the Appalachian region as 16.1% (ARC, "County", 2014).

The communities of Appalachian Kentucky, however, have been slower to overcome these economic hardships than those of other states in the region. From 2007 to 2011, Kentucky maintained an average poverty rate of 18.1%, compared to the national average of 14.3%. Even more striking, the 55 counties comprising Appalachian Kentucky reported a 24.8% poverty rate, 8.7 points higher than that of Appalachia as a whole (ARC, "County", 2014). These counties also report an average per capita income of only $16,923, compared to the national average of $32,562 (ARC, "County", 2014). Thirty-six of the counties qualify as "distressed", meaning the average poverty level falls within the lowest 10% of all US counties (ARC, "ARC-Designated", 2014).

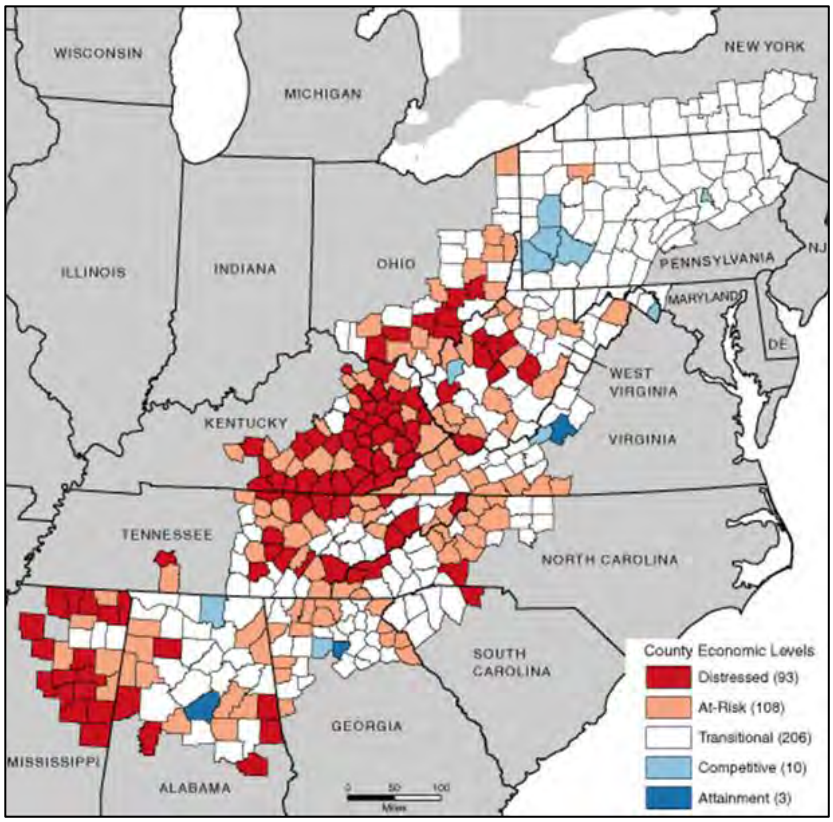

***Figure 3**. Appalachian Economic Status by County (ARC 2013)*

Economic hardship in eastern Kentucky largely resulted from a high level of reliance within these counties on mining sector and manufacturing jobs. Employment in mining and manufacturing is falling due to increasing global competition, outsourcing, changing energy policy, and a declining prime age workforce (ARC, September 29 2011). While the region's high school completion rate is 83.5%, and similar to the national average of 85.4%, there has been a consistently high level of rural out-migration over the past century, by which educated youth and prime age workforce members leave the region for job opportunities, primarily in urban areas (ARC, March 2013). Lower birth rates in recent years have combined with out-migration, resulting in rapidly declining population growth and aging regional demographics (Williams, 2002).

B. The Kentucky Community and Technical College System

The Kentucky Community and Technical College System (KCTCS) is well positioned to act as a catalyst for sustainable economic development. It is the largest postsecondary educational institution in the state, consisting of 16 colleges across more than 70 campuses. The colleges are located throughout the region, providing many otherwise isolated pockets of rural Kentucky with access to

critical resources for professional development. In addition to its network and resource capacities, KCTCS also has a unique understanding of the needs and values of the community, which enables the colleges to encourage regionally appropriate development. The system's mission to educate and support the professional development of Kentucky citizens in order to enhance their wellbeing has strengthened this relationship over time (KCTCS, 2013).

The college system has been an integral part of the community's economic fabric for almost twenty years, with responsibilities to Kentucky citizens far beyond academic support. In 1997, the Kentucky General Assembly recognized the value of maintaining a robust network of higher education centers to support the specific needs of often economically fragile and coal dependent regions (KCTCS, 2013). They consolidated 14 community colleges and 25 vocational or technical schools into what is currently known as KCTCS, with an umbrella mission to "improve the quality of life of the Commonwealth's citizens" (Higher Education Work Group, 2009).

This mission and values that inform the operations of KCTCS are also components of a sound foundation for sustainable economic development. The curriculum and outreach programs that the campuses provide are tailored to Kentucky's labor market, and KCTCS administrators aim to identify and support additional opportunities for community driven growth. As a result KCTCS has become "the primary provider of college and workforce readiness, transfer education, and workforce education and training" (KCTCS, 2013), to support community and economic growth across the state.

The KCTCS leadership has identified goals to ensure the community college system realizes its vast potential for the betterment of Kentucky citizens, including advancing excellence and innovation in teaching, learning and service; cultivating diversity, multiculturalism, and inclusion; increasing student access, transfer and success; enhancing the economic and workforce development of the commonwealth; and promoting the recognition and value of KCTCS (B. Hardin, personal communication, January 27 2014).

In keeping with its long held and significant role in Kentucky communities, KCTCS has actively sought to cultivate a culture that promotes sustainability and social justice. In 2011, KCTCS launched a statewide initiative on sustainability, called KCTCS Green+, to enhance the quality of life

of the citizens of Kentucky. This initiative encompassed social, economic, and environmental aspects of sustainability and has four primary driving forces: the environment, the state economy, energy, and community stakeholders (KCTCS, 2012). The colleges incorporated KCTCS Green+ into fundamental aspects of the system, including administration, curriculum, workforce development, outreach, and building operations. Through this initiative, KCTCS aims to become the "nation's premier community and technical college system" in sustainability (KCTCS, 2013).

To ensure that KCTCS meets the Green+ initiative goals, each of the 16 colleges that make up the system have developed local sustainability strategies. Each college has developed a unique framework tailored to meet its individual needs, which it then communicates across the system. Based on these individual sustainability frameworks and strategies, the colleges deliver sustainability progress reports to the KCTCS Board of Regents, after which, KCTCS makes the reports publicly available (KCTCS, 2013).

IV. Economic Development and Entrepreneurship

A. Economic Context of Appalachian Kentucky

As the United States rapidly industrialized during the turn of the 20th century, outside interests fueled the exploitation of natural and human resources of the Appalachian region. The resources most desirable at that time included timber, minerals, and, primarily, coal. Companies used these materials in the expansion of rail networks across the country. Coal businesses established "company towns," in which eventually three-fourths of the population of Appalachia came to reside (Straw, 2006). Mine owners tended to pay miners significantly less than at operations in the northern areas of the US, due to political opposition to unions and the maintenance of strong influence in local governments. The dominance of the coal and timber industries historically disallows rival or secondary industries, which meant the regional economy did not diversify over time. These factors, coupled with overexpansion and overexploitation, led to the emergence of an Appalachian economy vulnerable to external shocks and lacking in fundamental strength and versatility (Straw, 2006; Shannon, 2006).

Although the Second World War created demand for coal, the boom did not last. By 1960 more than three million people found it necessary to leave Appalachia for employment in cities, usually in

the South and Midwest (Straw, 2006). In 1933, as part of the New Deal, Roosevelt established the Tennessee Valley Authority (TVA) to provide electric power and flood control. This legislation is indicative of initiatives intended to spur economic growth through large infrastructure projects, which, while successful in other regions of the US, did not catalyze lasting development in Appalachia (Shannon, 2006). In addition, diesel oil, heating oil, and natural gas began to replace coal as the primary sources for heating and locomotive fuel. As a result, coal mining jobs dropped from 500,000 employed in 1945 to 200,000 employed by 1960 (Shannon, 2006).

By the 1960's, the economic situation in the Appalachian region had become dire, with little improvement in living standards or upward mobility. In 1965, President Lyndon B. Johnson signed the Appalachian Regional Development Act as a part of his War on Poverty. This legislation established the Appalachian Regional Commission (ARC), which, from 1965 to 2000, allocated $5 billion in federal and state funding for highway construction and $3.3 billion for vocational education, natural resource management, and tourism promotion (Williams, 2002). Although some historians find the federal program and its grassroots response limited in scope, the War on Poverty helped to instill a sense of pride and identity among Appalachian communities that continues to pervade the culture (Straw, 2006).

During the second half of the 20th Century, coal mining held steady, agriculture continued to decline, but services in healthcare, retail, and education grew. The low-tech manufacturing sector began shedding jobs due to labor outsourcing to developing economies, whereas high-tech jobs never grew in Appalachia due to the necessity of established infrastructure, educational capacities, and commercial networks (Shannon, 2006).

Currently, Kentucky is the third largest coal-producing state in the US, and produces about 9% of total coal in the nation. Kentucky generates approximately 93% of its electricity from coal, and its per capita energy consumption ranks in the top 10% of the nation (US Energy Information Administration, 2014). Kentucky also has the fifth lowest electricity prices in the country. Coal production is declining in Kentucky, however, due to increasingly strict emissions regulations from the Environmental Protection Agency and competition from natural gas (US Energy Information Administration, 2014). These factors have contributed to a higher unemployment rate.

According to the Kentucky Energy and Environment Cabinet, the number of Kentucky coal jobs has reached its lowest point since the state started recording the statistic in 1927. Most of this

decline has occurred in eastern Kentucky, while western Kentucky has in fact added jobs (Estep, August 2013). Mining production accounts for 2.2% of Kentucky's GDP and mining employment and coal mining employment make up 1.1% and 0.7% of total employment, respectively. While these numbers seem small in the context of the state's overall economy, fluctuations in energy policy and markets significantly impact the communities in which coal jobs are geographically concentrated, chiefly Appalachian areas. Coal employment includes employees engaged in preparation, processing, development, maintenance, repair, shop or yard work at mining operations, management and all technical and engineering personnel, rather than only miners alone (Bureau of Economic Analysis & Energy Information Administration, 2013).

B. Entrepreneurship

The NAACE and the ARC have identified entrepreneurship as a crucial catalyst for sustainable economic development in Appalachian Kentucky, and thus the KCTCS leadership has instructed Columbia's Team to focus on opportunities for entrepreneurial advancement and education. Entrepreneurship is critical to economic development in part because business creation brings together the stakeholders, supporting institutions, and capital resources of a region to propel economic growth. Entrepreneurship creates jobs from within local communities, promoting the development of reciprocity and networks between businesses (Rural Support Partners, November 2013). The following section summarizes existing programs intended to promote economic investment and the development of entrepreneurship in Appalachian Kentucky, including federal programs, state initiatives, and other general financing opportunities.

1. Federal and Regional Policy

In January of 2014, President Obama designated southeastern Kentucky as one of five Promise Zones (ARC, 2014). The Promise Zones Initiative, under the direction of the US Department of Housing and Urban Development, facilitates government investment in high-poverty areas to engender comprehensive community revitalization. Through the development of entrepreneurship training and industry-specific workforce training, southeastern Kentucky residents will receive the tools to accelerate the development of the local economy. The revitalization plan awarded $1.3 million in funding to the Kentucky Highlands Investment Corporation (KHIC) for job creation and small business growth in the region. The eight Appalachian counties of Bell, Clay, Harlan, Knox, Leslie, Letcher, Perry, and Whitley will benefit from KHIC's initiatives with the goal of creating

more resilient local economies (The White House, 2014). Additionally, Promise Zone funding will assist KHIC with implementing a 10-year strategic plan, working alongside the federal government to alleviate endemic poverty in the region and accelerate diversification (ARC, 2014).

The Appalachian Regional Commission (ARC) is a federally constituted agency that brings together federal resources, state agencies and local governments to encourage the sustainable economic development of Appalachia. The ARC has established a variety of programs with the intention of encouraging job growth, increasing average per capita income, strengthening infrastructure, and promoting entrepreneurship. The Commission funds projects in a wide range of areas including energy, tourism, telecommunications, education, and the improvement of existing assets, among others. The ARC's entrepreneurship and business development initiatives work to foster a climate of innovation by increasing accessibility of capital, improving education through youth and adult training programs, and capitalizing on the strength of local communities by utilizing a sector based approach to small business development. The initiatives also provide for technical assistance and strategic support to businesses in the region (Appalachian Regional Commission, n.d.).

The partnership between the National Association for Community College Entrepreneurship (NACCE) and the Appalachian Regional Commission (and the catalyst for this KCTCS study) emphasizes the importance of community colleges as strategic partners for entrepreneurship and sustainable economic development in the Appalachian region. The initiative bolsters student entrepreneurship opportunities and fosters an entrepreneurial environment in the communities surrounding colleges. Current NAACE programs are integrated into local colleges through scholarships and funding to the NACCE Fellows Programs, the Presidents for Entrepreneurship Pledge, and the NACCE's Entrepreneurship Specialist Certificate Online Training program. The partnership has made coaching and mentoring around entrepreneurship best practices available to community college students. The intention of these activities is to help bridge the gap between local and national entrepreneurship activity (National Association for Community College Entrepreneurship, 2014).

Governor Steve Beshear and Congressman Hal Rogers announced the Shaping Our Appalachian Region (SOAR) initiative in 2013 to address economic hardship in the region. The SOAR initiative established a $2.6 million loan pool to support small business and entrepreneurship in eastern

Kentucky. During its annual summit, launched in 2014, SOAR can provide a platform to generate ideas on how to move Kentucky forward, gathering stakeholders and community members representing interests ranging from the arts to technology to discuss potential solutions (Kentucky Cabinet for Economic Development, 2014).

In January of 2014, Governor Beshear also announced a state and federal joint initiative to invest federal resources in the extension of high-speed broadband Internet access throughout Eastern Kentucky (Gov. Beshear's Communication Office, 2014). The state of Kentucky will implement this project in conjunction with the Center for Rural Development. At present, reports indicate that Kentucky lags behind in Internet access, with only 74% of households having access, which is 5% below the national average (U.S. Census Bureau, 2012). The long-awaited resource will be critical to spurring economic development in the region.

2. State Policy

The Kentucky Cabinet for Economic Development is an agency that promotes economic growth in the state of Kentucky through job creation and investment. The Cabinet offers an array of business development services through the Office of Research and Public Affairs and the Office of Entrepreneurship, including training in communications, research, site evaluation, and GIS analysis. Additionally, the Cabinet encourages entrepreneurship and business development through facilitating workforce training and counseling and securing financial assistance, and has established the Kentucky Innovation Network, which offers business development services to over 120 counties throughout Kentucky. Offices assist innovators through the evaluation of business models, market assessment, and growth strategy consultation. These facilities also provide connections to professional networks, potential suppliers and partners, and coaching on how to secure funding (Kentucky Cabinet for Economic Development, n.d.).

The Office of Entrepreneurship works alongside the state's Commission on Small Business Advocacy to address public policy and legislation as they pertain to small businesses in Kentucky. The mission of the group is to improve the climate for small businesses in the state through "education, cooperation, and advocacy." They educate the business community on relevant federal, state, and local legislation, and work to advance the interests of small business owners in the development of relevant policy. The commission also fosters relationships between government

agencies and the private sector (Kentucky Cabinet for Economic Development, n.d.).

The state offers a variety of financing programs for small business owners and entrepreneurs to source capital for their ventures. The Kentucky Cabinet for Economic Development has allocated federal funding to implement the Kentucky Small Business Credit Initiative, which is comprised of three programs designed to improve credit accessibility, utilizing private funding to reduce the risk to lenders. The state also provides funds through the Kentucky Economic Development Finance Authority, which offers financial loans for emerging or growing businesses in the fields of manufacturing, agri-business, service, and technology. The Authority's qualifications for loan procurement are more lenient than industry standards. Finally, the Kentucky Small Business Tax Credit endows qualifying businesses with nonrefundable state income tax credits for investing in qualifying equipment or technology and hiring employees (Kentucky Cabinet for Economic Development, n.d.).

V. Industries Background

A. Sustainable Agriculture and Local Food

1. Background in Sustainable Agriculture and Local Food

One industry that offers great potential for entrepreneurial growth and economic development in Kentucky is sustainable agriculture and local foods. The state currently boasts over 85,500 farms. Kentucky ranks fourth in the nation in total number of agricultural operations (although more than 60% of these farms are small operations with annual sales of $10,000 or less). In 2012, the leading five commodities in the state were poultry, other livestock (not poultry, swine, or cattle), corn, soybeans, and cattle (Kentucky Farm Bureau, 2013). In 2013, economists at the University of Kentucky's College of Agriculture, Food, and the Environment estimated that Kentucky exceeded $6 billion in agricultural receipts due to a strong livestock year, outpacing 2012's record-breaking levels of $5 billion. Projections for 2014 suggest that livestock sales will remain strong, though general crop prices may decline (UK CES, 2013).

The ARC has suggested that sustainable agriculture is a viable driver of economic growth in communities similar to those of eastern Kentucky. An ARC sponsored study of West Virginia illustrates that if the farmers of that state grew sufficient produce to meet residential demand, the

industry would generate 1,700 new jobs and $35.7 million in additional revenue. This process would require converting less than 10% of the state's available farmland to agricultural production. Such a policy would encourage the generation of profits, employment opportunities, and infrastructure within the state. The ARC suggested targeting agricultural crops that are currently under-produced to fill unmet demand (Hartz et al., 2002).

Although there is no uniform official definition, the 2008 Food, Conservation, and Energy Act defines "local food" as an agricultural food product purchased less than 400 miles from its origin or within the state of its production (Martinez *et al.*, 2010). Studies show that local food system expansion can stimulate economic growth through import substitution, consumer spending, farmers markets, and the localization of processing activities. Economist David Swenson at Iowa State University estimated that the economic output multiplier of local food in the Upper Midwest is between 1.55 to 1.78, meaning that every dollar generated through local food stimulates an additional $0.55 to $0.78 in revenue for the region through related and dependent activities (Rural Support Partners, 2013).

In addition to benefiting local economies, local food consumption can help improve public health and reduce the medical burden on health care providers. Between 62.5% to 76.2% of adults in eastern Kentucky are overweight, which is significantly higher than the national average of 58.5%. Obesity can lead to chronic conditions such as diabetes and cardiovascular disease. Only 19% of Appalachian Kentuckians meet their Recommended Daily Intake in fruits and vegetables, which can be attributed to the geographically isolating nature of Appalachia's physical environment, the high prevalence of fast food restaurants, and individual lifestyle choices (Schoenberg et al, 2013). In addition, norms in consumption of regional foods consist primarily of meats, fried foods, and high-fat carbohydrates. Lastly, healthier options are often more expensive and thus inaccessible to households with low incomes (Liese et al., 2007).

In summary, sustainable agriculture and local foods offer opportunities for economic growth in eastern Kentucky for several reasons. First, the unmet demand for local food exists. Second, studies and initiatives in other states illustrate that sustainable agriculture can be successful in Appalachia and is appropriate to the regional culture and economic environment. Finally, sustainable agriculture is particularly relevant to the KCTCS goals given the pivotal role institutions

of higher education can play in building vital community capacities.

2. Current KCTCS Offerings Related to Sustainable Agriculture

The curriculum and programs currently in place at KCTCS already provide some education, training and resources related to sustainable agriculture and local food. In the KCTCS System, the Sustainable Agriculture track is a part of the program in Agricultural Technology. The Associates Degree contains a general core curriculum, including math, biology, and chemistry, while the technical core courses involve soils, agriculture, animal science, plant production, and an agricultural internship. In addition to the core, the Sustainable Agriculture track teaches horticulture science, sustainable agriculture, organic agriculture, business, and marketing. This program is offered at Henderson, Hopkinsville, and Owensboro colleges. The certificate in Sustainable Agriculture contains most of the introductory track courses and technical courses.

The Associate of Applied Business program includes a Turf Grass/Landscaping Management Track that requires an agriculture seminar and plant identification class in addition to turf grass and landscape maintenance. This track is also a certificate program at Owensboro and Somerset Colleges.

The Culinary Arts program contains coursework in nutrition, management, and food procurement, which all relate directly or indirectly to sustainable agriculture. Within this program, KCTCS offers degree programs in Culinary Arts and Food and Beverage Management. The majority of the colleges in the system offer an Associates degree, diploma, or certificate in Food and Beverage Management.

The KCTCS Horticulture Program offers an Associate in Applied Science degree at Jefferson and Owensboro Colleges, requiring coursework in greenhouse management, landscape maintenance, and plant science. Certain colleges offer diplomas in Landscape Technology and Ornamental Horticulture. Finally, certificates are available in Greenhouse Operations, Greenhouse Production, Horticulture Sales, Landscape Installation, Landscape Planning, Lawn Maintenance, Nursery

Production, and Nursery Operations at a variety of KCTCS colleges. This information is available through the 2013-2014 KCTCS Catalog (KCTCS "Catalog", 2013).

***Table 1**. Programs of Study Related to Food or Agriculture in KCTCS Colleges of Focus*
C = Certificate, D = Diploma, A = Associate's Degree

	Culinary Arts Program	Horticulture Program	Applied Business - Turf Grass/ Landscaping Track	Culinary Arts -Food and Beverage Management Track
Ashland	C, D, A	D	None	A, C, D
Big Sandy	A	C, D	None	C, D
Elizabethtown	C, D, A	None	None	C, D
Hazard	None	None	None	None
Maysville	C, A	C, D	None	A, C, D
Somerset	C, D, A	None	C	A, C, D
Southeast Kentucky	A	None	None	A, C, D

The system also maintains a program to place Adult Agriculture Regional Instructors at several of the colleges. At Somerset College for example, three educators update farmers on best practices, particularly related to increasing production capacity and rural quality of life. They conduct farm calls, create newsletters, provide on-farm consulting, and host regional informational meetings at Somerset Community College computer labs, usually between growing seasons. These instructors also advise the Kentucky Youth Farmers Association (KYFA), an organization of recent high school graduates interested in agricultural entrepreneurship, through Young Farmers Educational classes at KCTCS. The instructors additionally organize contests, banquets, and farm tours (SCC "Agricultural Educators", n.d.).

Outside KCTCS, the University of Kentucky offers coursework related to sustainable agriculture.

The core courses concern cultural perspectives, plant production, agricultural economics, chemistry, biology, plant and soil science, nutrition, sociology, entomology, and plant pathology. The curriculum also features an apprenticeship program that requires 250 hours of applied fieldwork, culminating in a capstone program in which the students attend an educational agricultural experience out of the state (University of Kentucky, 2011).

3. Sustainable Agriculture and Branding Initiatives

For local food and sustainable agriculture systems to become successful, a food supply chain must match production from small local farmers with demand from consumers. The commercial marketing strategy of branding can strengthen this connection by creating a label, image, or other medium that provides a unique narrative and self-identity for products (Ruel, 2012). Branding regional local food in particular can help develop the economy of the Appalachian region for several reasons. First, economists who study branding note that it can generate significant revenue through product differentiation and the creation of consumer aspiration (Ruel, 2012). The CAN program launched in 1993 in order to form a network of regional community stakeholders with the mutual mission of advancing Appalachia's "economic transition;" the 2012 successes of four regional brands that are part of the Central Appalachian Network (CAN) and its affiliates demonstrate branding's transferability from other Appalachian states such as Ohio, North Carolina, and Virginia (Ruel, 2012). Third, branding local food is culturally appropriate because there already exists a homesteader culture and history of growing one's own food in the Appalachian region (Ruel, 2012).

Branding campaigns can also help to overcome the challenges inherent in local food production and sale in Appalachia. Two primary obstacles are low average farm capacity and geographical isolation due to mountainous topography. The median size of a farm in Appalachian Kentucky is approximately 83.5 acres, and this small size indicates that farms often lack the capacity to produce high volumes or individually influence the market. Geographic isolation separates remote rural farms from distribution networks and market locations. Successful branding, however, can strengthen and reshape food supply networks through the simultaneous formation of partnerships with farmers' markets, farm to school programs, connections to urban areas, and food hubs that sell these branded local foods (Rural Support Partners, 2013). Branding strategies can increase the farm capacity and market access of these small farms that are not well integrated in the food supply

network.

In order to strengthen the connection between local market production, distribution, and consumption, the Kentucky Department of Agriculture created Kentucky Proud, a marketing initiative that includes three components. These three component programs include Homegrown by Heroes, which celebrates military veteran farmers, Udderly Kentucky, which brands milk, and the new trademark, Appalachian Proud (Comer, 2013). Appalachian Proud is a branding strategy that aims to grow the agriculture economy by crafting narratives around local entrepreneurship and traditions in the production of quality food. It engages with education and research institutions by encouraging each college to develop and research a niche agricultural product, which are products that grow especially well in a certain region. Colleges have already taken on products such as ginseng, honey, sorghum, and mushrooms in Appalachia. The initiative also established Future Farmers of America chapters in every school district, created a new mobile science activity center, and launched hemp pilot programs. The strategy also identifies and develops new markets, like using reclaimed mine lands for the Appalachian Proud Wildlife Center and encouraging colleges and schools to join Farm to Campus and Farm to School Programs (Comer, 2013).

There are several challenges to establishing a successful branding and marketing campaign around local foods and sustainable agriculture. Challenges to branding Appalachian food within the Appalachian Proud initiative primarily center on coordinating existing brand strategies. Because brands created through the Central Appalachian Network or its affiliates already exist, a new brand must be able to differentiate itself among similar brands to avoid consumer confusion. Other challenges include obtaining grant funding and creating a structure for expanding the brand in conjunction with those other existing brands (Ruel, 2012).

A strong branding campaign that brings together the state government, nonprofit organizations, and educational institutions can overcome these challenges. Educational institutions like KCTCS are indispensable to branding because they can provide education and training that are necessary for branding strategy, and we will further explore these strategies in the recommendations section.

B. Remediation

1. Background on Coal Mining and Environmental Remediation in Eastern Kentucky

Kentucky is the top coal-producing state in the Appalachian region, due to eastern Kentucky's large reserves of soft and easily ignitable bituminous coal. Coal mining in Kentucky initially employed underground mining with manual tools like picks and shovels, and then progressed to the use of machines to cut the seam. This mechanization brought about operational health and safety hazards, including roof falls, mine explosions, and chronic pulmonary diseases. These new techniques also created negative environmental impacts such as surface water and groundwater contamination, surface subsidence, and soil erosion. As underground mining transitioned into surface mining, the process of coal exploitation generated even more severe environmental impacts (Rouse and Greer-Pitt, 2006).

Mountaintop mining is a form of surface mining that has become increasingly prevalent in eastern Kentucky, but it is controversial due to resulting increased harm to the environment. This form of mining involves removing mountaintops to access underlying coal seams and disposing of the overlying rock and soil in neighboring valleys, called "valley fills" (EPA, 2013). Local environmental groups argue that the excess spoil from mining bury streams as well as destroy wildlife habitat and forests. On the other hand, mining companies argue that this technique is essential because the poor soil stability makes underground mining techniques unfeasible, while the steep topography makes the disposal of mining spoil in valleys essential (Copeland, 2013).

Several studies have documented the negative effects of mountaintop mining on streams, forests, and biodiversity in eastern Kentucky. Pond (2012) assessed stonefly (Plecoptera) and caddisfly (Trichoptera) assemblages in Appalachian Kentucky's headwater streams between 1999 and 2004 in relation to mining and residential land uses. The study found lowered species richness in mining and residential sites compared to undisturbed reference sites, and about 70% loss of common genera of both taxa. Pond (2012) notes that headwater streams are especially vulnerable to land use disturbances like mining because of aquatic-terrestrial linkages and sensitive fauna. As for mayfly

(Ephemeroptera) species abundance and richness, Pond (2010) found that these measures were lowest in mining sites compared to residential and undisturbed sites. He also found that lowered relative abundance of mayflies had the strongest correlation with increased specific conductance of streams due to mountaintop mining.

Although the fauna of these headwater streams are well adapted to the fluctuating flows within their isolated pool habitats, they are not resilient to the drastic change in water chemistry that result from valley fills (Palmer and Bernhardt, 2009). These headwater streams are also biodiversity hotspots that support hundreds of species, some of which are unique to their habitats, as well as 10% of salamander and freshwater mussel diversities globally (Palmer and Bernhardt, 2009). Not only do the headwater streams provide important refuge from predators and spawning grounds, they are also critical parts of stream networks, because their biota, sediment, and dissolved substances feed waters downstream (Bernhardt and Palmer, 2011). Bernhardt and Palmer (2011) conclude that mountaintop mining has severe, large-scale, and enduring environmental impacts in Central Appalachia.

Pond et al. (2008) found significant downstream effects of mountaintop mining, including a decline in relative abundance and species richness of mayflies, stoneflies, and caddisflies, as well as changes in stream chemistry in mined sites compared with un-mined sites of West Virginia streams. Specifically, streams affected by mining had higher alkalinity and ionic strength. An assessment report by the EPA (2011) supports the above findings based on evidence showing that mountaintop mining eliminates springs and streams, elevates downstream ionic concentrations and selenium concentrations that are toxic to fish and birds, and degrades macro-invertebrate and fish communities.

Mountaintop mining also negatively impacts forest ecology in the Kentucky Appalachian region. Wickham et al. (2007) illustrate that mountaintop mining in the region accelerates the loss of interior forests by converting them to edge forests. This is of global ecological significance because the rare, large expanses of undisturbed temperate deciduous forest support greater amounts of habitat and wildlife, more atmospheric moisture, and more keystone ecosystem services.

2. Resources Currently Available Related to Environmental Remediation

Currently, various programs are in place to mitigate the harmful ecological effects of mountaintop mining. The Obama administration recently began to implement an interagency action plan to reduce the environmental impact of mountaintop mining through tighter regulation, more stringent reviews of mining permit applications under the Clean Water Act and Surface Mining Control and Reclamation Act of 1997 (SMCRA), as well as increased public engagement (Glunz, Barkoff, Andy, Pawlik, 2009). The SMCRA requires that mine operators minimize impacts on fish, wildlife, habitat, and hydrologic balance; restore stream channels and riparian vegetation by constructing stream diversions; as well as restore the contour and vegetation of mined sites (EPA, 2011).

One program intended to improve the environmental footprint of mining operations is the Appalachian Regional Reforestation Initiative (ARRI), a collaboration among academia, local communities, industry, and government to reestablish productive forestland on coal mine sites. The ARRI advocates the use of Forest Reclamation Approach (FRA) technology, which is supported in forestry research at the University of Kentucky, Virginia Polytechnic Institute and State University, and West Virginia University. The ARRI has a core team consisting of members from each Field Office of the Office of Surface Mining Reclamation and Enforcement, and each State Regulatory Authority of the seven Appalachian states, as well as an academic team of experts from ten different universities and the US Forest Service. ARRI's goal is to increase the amount of high-value hardwood trees on coal mine sites, increase their survival and growth rates, as well as encourage forest restoration through natural succession (Angel, Burger, and Graves, 2006).

Implementing FRA technology for mine reclamation, the method championed by the ARRI, requires multiple steps for successful implementation, but this process has thus far proven difficult to put into practice. The implementation steps include creating suitable rooting media for trees, using native ground covers that are compatible with growing trees, planting early-succession tree species for soil stability, and using proper tree planting techniques (Angel, Burger, and Graves, 2006). The current barriers to successful and widespread FRA implementation are primarily cultural norms, education, and funding (Angels et al., 2009). Stream mitigation efforts consist of those that

focus directly on restoring streams in valley fills, such as constructed channels, natural channel design, and erosion control structures and constructed wetlands, as well as those that focus on restoring waters downstream of valley fills, like restoration of riparian forests and stream channel enhancement (EPA, 2011).

VI. Recommendations

The research and analysis of the industry specific opportunities and inherent KCTCS capacities laid the foundation for the Team's recommendations. Through this analysis, the Team was able to determine the suitability of each industry for sustainable economic development and entrepreneurship, promising directions for their growth, existing resources to support this growth, and additional areas where KCTCS can offer support. When the industry specific and system wide research were brought together, the Team found common themes as it pertains to barriers to, and resources for, sustainable economic development.

The three main barriers to the development of the two industries and to the integration of a culture of sustainability and entrepreneurship include a) the physical isolation of eastern Appalachia from the city and industry centers, b) the need for new skills and retraining of the workforce, and c) the need for additional infrastructure and resources to support and finance new directions of growth.

The Team then identified the three main capacities inherent in the KCTCS system that could be used to overcome these barriers. These capacities include the 1) pervasive network and reach of the college system to overcome issues of isolation, 2) the extensive opportunities for curriculum development and new workforce training programs to help introduce and foster new skills, 3) and the college system's physical presence and ability to access grants and funding to support the need for additional infrastructure and resources.

As a result, the Team developed a set of recommendations for sustainable agriculture and for environmental remediation that drew from one of more of the identified strengths of KCTCS; network, education, and infrastructure. In addition, the Team identified how KCTCS can leverage these capacities to strengthen its offerings as a system, offering several recommendations on how it can support a culture of sustainability and entrepreneurship no matter the sector.

A. System Level Recommendations

KCTCS can leverage its unique organizational capacities within eastern Kentucky communities to overcome barriers along the path to sustainable economic development. These system-wide recommendations draw on the inherent strengths of the college system as a community facilitator to help establish the foundation for sustainable development and entrepreneurship. They function to compliment and support industry specific recommendations in sustainable agriculture and environmental remediation through providing the framework to accelerate those initiatives, to strengthen particular capacities essential for their success, and to foster a general culture of sustainability and entrepreneurship.

As a system of colleges across Kentucky, with established infrastructure and community partnerships, KCTCS is poised to harness its resources and connections to scale successful existing programs, as well as develop new initiatives. The state of Kentucky and local communities also expect the college system to do so. In a 2013 statute sponsored by Representative Carl Rollins, the state charges KCTCS with the responsibility to, "establish and help coordinate the activities of regional environmental education centers and advisory committees at all state universities" and at the central office of the system, "to serve as networks for the dissemination of environmental education programs, materials, and information across the state" (KCTCS, 06/01/2013).

To realize the full potential of the colleges and surrounding communities, it is vital that KCTCS centralize its relevant resources and provide a support system for both industry and system level initiatives. Each college and local community has unique strengths and weaknesses in spurring entrepreneurship and the integration of sustainability, and all could benefit greatly from pooling resources, exchanging ideas and best practices, and collectively promoting offerings. This idea of collaboration and sharing knowledge and capital provides the foundation for the three system wide recommendations.

Establish the KCTCS Institute for Sustainable Development

Description

The KCTCS administration should leverage its network and community resources by centralizing and coordinating relevant academic and community programs within an Institute for Sustainable Development, to help promote and scale existing and new initiatives.

The KCTCS Institute for Sustainable Development will serve as the physical heart of the Kentucky sustainability and entrepreneur resource networks, acting as a hub for all related initiatives across the campuses and communities. The Institute will offer space to work, provide resources upon which students and professionals can draw, and develop a network to promote related programs. The KCTCS leadership should equip the organization with a small full time staff, as well as visiting representatives from the various colleges, who will oversee the system wide network. A vital component of this initiative will be digital; the Institute's website will offer links to community organizations working in sustainable development, track system wide activities, promote upcoming events, and serve as a digital platform for the community.

Rationale

The KCTCS structure provides the ideal foundation for centralizing and coordinating all research, initiatives and actions related to sustainable economic development in Appalachian Kentucky. The system's network of college campuses, embedded within local communities, helps to engage key stakeholders and gather vital information. In turn, the overarching administration and its network of contacts in academia, government, and the private sector will help to provide direction and coordination for programs and resources. This will also improve the accessibility of such programs and resources for researchers, local stakeholders, and potential entrepreneurs by creating a streamlined and simplified platform to host related materials.

Desired Outcomes

By pooling and coordinating community resources and providing physical infrastructure and a digital network, the Institute will help to advance sustainable education and research efforts. It will also increase the accessibility and visibility of resources that support entrepreneurship, and provide a network through which to encourage communities to embrace a culture of innovation. It will increase the outreach capacity of the KCTCS system, with a full time staff that can be dedicated to forming partnerships with organizations that can assist in academic development, such as faculty training, or community business support, including grant and technical support.

Timeline

0-2 Years:

- Obtain funds and core vision team
- Write mission statement
- Contact partner organizations
- Create web portal

2-4 Years:

- Construct center
- Hire staff
- Hold sustainability conference and workshop series

4-6 Years:

- First impact assessment

Budget

In order to avoid unnecessary construction costs of a new center, it is recommended that KCTCS

repurpose an existing facility to house the Institute for Sustainable Development. Should KCTCS move forward with plans to construct a center for environmental studies as discussed during the Client Briefing, it would be ideal to merge these projects into one overarching institute with a shared mission and relevant subdivisions as it pertains to environmental studies, sustainable development, and entrepreneurship. Under the assumption that the fixed cost of the physical structure is already accounted for in the budget of the original project for the environment center, the Institute's main costs will include:

Staffing:

- Full time staff salaries
- Part time staff hourly wages
- Intern hourly wages

Support:

- Website development
- Promotional materials

Events: (Costs include operational support, panelist and lecturer compensation, food and beverages, and promotional materials)

- Conferences
- Seminars
- Workshops

The Institute can support its operations through charging conference registration fees as well as workshop and seminar fees. Other funds can be obtained through donations and grants.

Measures of Success

Quantitative:

- Number of resources made available on digital platform
- Number of organizations that associated with the Institute

- Number of visitors to the physical site
- Number of conferences held
- Number of new business started with help from the Institute
- Website traffic

Qualitative:

- Satisfaction of visitors
- Community perception of sustainability and entrepreneurship
- Accessibility of resources

The full time outreach manager will be responsible for overseeing impact evaluation. The Institute should use visitor sign in and website monitoring to assess traffic to the resource center, as well as surveys of visitors and community members sent via the KCTCS member database to assess qualitative indicators such as visitor satisfaction, community perceptions, and perceived accessibility of resources. Changes to the business climate will be ascertained from the Kentucky Economic Bureau Reports. The full time outreach manager may choose to hire an intern or assistant to help with the yearly impact report.

Establish the KCTCS Business Incubator

Description

We recommend that KCTCS establish the KCTCS Business Incubator to provide infrastructure for access to capital for small business in their communities, and to identify specialized training for business, industry, and community stakeholders. An incubator is a platform that can create an entrepreneurial climate in the community. By lowering the costs of entering into business, including raising capital, establishing networks, and obtaining essential training, an incubator helps entrepreneurs overcome the challenges that might lead their new businesses to fail or prevent their establishment all together.

Rationale

The KCTCS Business Incubator will help to reduce the risk of small business failures in eastern Kentucky communities. The National Business Incubation Association (NBIA) reported that 87% of all firms that have graduated from incubators are still in business, with approximately 70% of new employer firms lasting at least 2 years and about 50% surviving 5 years or more (Cochrane, 2011; NBIA, 2009).

Business incubators contribute to local and regional economies in many ways. NBIA estimates that in 2011 alone, North American incubators assisted about 49,000 start-up companies that provided full-time employment for nearly 200,000 workers and generated annual revenue of almost $15 billion (NBIA, 2009). A $1 public investment in an incubator brings in $30 in local tax revenue (Cochrane, 2011). The economical effect will help to improve local infrastructure in eastern Kentucky.

Desired Outcomes

A business incubator fosters the creation and development of business start-ups by offering

technical and financial assistance and services at low costs, platforms to expand business, and essential training in best practices (NBIA, 2009). The creation of an incubator in eastern Kentucky will help to increase the number and quality of both startups and mature companies in the region, resulting in local economic development. Aligned with the Institute of Sustainable Development and other industry level initiatives, the KCTCS Business Incubator will improve local economy and community resiliency.

Timeline

Feasibility Study (3 Months):

A feasibility study includes fact-finding, reaction testing for communities and stakeholders, and gap identification. Fact-finding mainly concerns obtaining information about relevant markets and available resources. To run the incubator as a business, KCTCS should regard what the organization offers as a product or service, and client entrepreneurs as customers. The incubator should design and deliver this product/service based on the unique needs and desires of its "customers." Thus, understanding the market is essential at this stage (NBIA, 2009). The resources available determine in large part what KCTCS can achieve in this industry. These resources include facilities, services, finances, media opportunities and partnerships. In this case, infrastructure refers to robust physical infrastructure and defined procedures for use of the equipment and services. The services of the Business Incubator should include common incubator services as well as the education that the community colleges provide, which is the unique strength of KCTCS.

After examining the needs of the market and the assets of KCTCS, the administration should complete a gap analysis and develop a plan to bridge those gaps. At the same time, it may be necessary to test community and internal reactions to identify challenges and support. From the outset, KCTCS should create flexible plans to allow for adjustments and improvements to ensure smooth project implementation.

Preliminary Plan (7 Months):

The KCTCS administration should generate and deliver an outline of a preliminary plan, including primary goals, to small groups of interested parties, with the intention of obtaining outside opinions and insights. After forging a consensus, the plan should then be revised. According to the NBIA,

the preliminary plan should comprise eight sections concerning the operations of KCTCS Business Incubator, and the administration should use this plan to guide the establishment of the KCTCS Business Incubator as well as in soliciting donations and sponsorships.

- Organization

The KCTCS Business Incubator must first decide upon and establish its legal status as either as a non-profit or a for-profit organization. We recommend the Incubator initially operate as a non-profit as it will be easier to obtain investment and foster community good will. KCTCS Business Incubator should state its mission clearly and show a clear plan for staffing, including but not limited to an internal board (for operations), external board (for advisory) and other full time staff.

- Facilities

The facilities plan will include the location, physical configuration, high-tech equipment, and security of the KCTCS Business Incubator. The location of any business incubator is crucial, as it must be established in a central location to attract clients and employees, with access to transportation routes and commercial networks.

- Program Design

Program design is the most important facet of incubator planning. The KCTCS Business Incubator will utilize the KCTCS educational expertise to offer four major services: basic services, funding, networking and training. Basic services refer to services such as office and conference room renting, software, and logistics, which are necessary for day-to-day operation. The KCTCS Business Incubator can also play a leading role in searching for and soliciting funding for those early stage businesses. The Incubator will also provide a platform to host events and provide clients networking opportunities. The KCTCS administration can also translate existing courses and workshops in an effort to train new entrepreneurs in the Incubator, providing them with the necessary skills to manage and sell their businesses.

- Marketing

The KCTCS Business Incubator must generate a strategic marketing plan to secure excellent clients as well as to obtain funding from donations and sponsorships. Potential components of such a strategy include open houses, social networking events, regional entrepreneurship events (e.g. Kentucky Entrepreneurship Week), and Incubator Service Day. Marketing the clients of the KCTCS Business Incubator is another responsibility of the organization and vital to the marketing strategy. In addition to assisting in their marketing and media communications, KCTCS should

identify a few showcase clients who will be able to promote the Incubator and demonstrate its successes.

- Financing

The financing strategy should present a clear plan for how the KCTCS Business Incubator will acquire funding and revenues and how the money will be used.

- Implementation

An implementation plan outlines for staff and external stakeholders the process for establishing the Incubator and launching its initial round of clients.

- Risks and Tactical Alternatives

The KCTCS administration maintains access to resources stemming from its connections to local communities that should inform its assessment of potential obstacles, and help the Incubator to develop plans to overcome them.

Pilot Implementation (2 Years):

The implementation of a pilot program will take approximately two years. This process will provide the KCTCS Business Incubator with a dynamic mechanism to assess its operations and amend its plans. A pilot program also allows the incubator to reduce its risks of losing money and damaging its reputation by anticipating issues and testing its operations prior to official launch. The KCTCS Business Incubator may expand its operations gradually while gaining experience.

Budget

Costs will include staff salaries and training; administrative and facilities expenses (both initial and ongoing expenses); and program services such as events, marketing, training, etc.

Two major revenue sources include fundraising and fees from client businesses. According to the NBIA, 32% of North American business incubators are sponsored by academic institutions, 25% by economic development organizations, 16% by government entities, 4% by other types of organizations, while 4% are supported by more than one sponsor, 4% by for-profit entities, and 15% have no sponsor or host organization (NBIA). There are a wide variety of potential donors or partners for the Incubator, including Commonwealth Seed Capital Fund, Kentucky Enterprise Fund

and Rural Innovation Fund, SBIR-STTR Matching Funds Program, Kentucky Business Investment Program, the Kentucky Small Business Development Center, the Appalachian Center for Economic Networks, Kentucky Entrepreneurial Coaches Institute, and STARTUPS@KSTC at Kentucky Science & Technology Corporation. Fees collected from clients include rental and necessary service fees.

Measures of Success

Running an incubator is similar to running a business. The definition of success depends on the goals and nature of the incubator. The primary goal of a business incubation program is to support the development of start-up firms that "graduate" as financially viable companies.

The National Business Incubator Association (2009) provides a recommendation list of best practices for business incubators in general:

- Governance

Obtain consensus on a mission that defines the incubator's role in the community and develop a strategic plan containing quantifiable objectives to achieve the program mission. Build an effective board of directors committed to the incubator's mission and to maximizing management's role in developing successful companies.

- Staffing
- Incubator Finances
- Selecting Clients

Implement an effective application and screening process that identifies companies that can help the incubator achieve its mission.

- Serving Clients

Prioritize management strategies to emphasize client assistance, including proactive advising and guidance that results in company success and wealth creation.

- Graduation

Implement a graduation process based on established criteria that promote incubator and graduate success. Regularly monitor client progress toward achieving graduation criteria.

- Marketing and PR
- Facilities Management

- Measuring Impact
- Environmental Impacts

Metrics for incubator success include two aspects: Performance Monitoring and Impact Evaluation. Performance Monitoring concerns the measurement of progress, which should include the aforementioned ten aspects of best practices. Impact Evaluation informs stakeholders of whether the KCTCS Business Incubator accomplishes its goals, such as in improving the local economy and community resiliency. The monitoring and evaluation could be done both internally and externally. The internal evaluations help to improve operations and should occur more frequently, while a third party should undertake external measurements to increase the credibility of the Incubator and apply results to review and improvement processes. There are also multiple non-economic indicators, like social impacts, that result from business incubators, which are very difficult to measure but should be discussed in any metrics strategy (Brightspot Strategy, 2012).

Launch a Campaign to Communicate Sustainability and Entrepreneurship

Description

We recommend that KCTCS develop a sustainability campaign to communicate the concepts of sustainable development and entrepreneurship in a way that better resonates with Kentucky citizens. The Institute for Sustainable Development will house the campaign, which will also inform the community of resources available through KCTCS to support sustainability education and entrepreneurship.

Rationale

Sustainability and entrepreneurship are somewhat abstract and inaccessible terms, but proper rebranding of these principles in the context of the Kentucky community can generate momentum around sustainable economic development supported by the community itself. We recommend that the campaign portray an image of **Pride** in Kentucky's natural resources, **Resiliency**, **Independence**, and **Progress**, with an agricultural focus. Using, for example, slogans such as: "Kentucky Forever," "Staying connected to our roots,"" Preserving Kentucky," and "Help build small businesses that better suit the people of the Kentucky blue grass state." Using this type of terminology will show that the Institute wants to help the community strengthen Kentucky through its own values, culture, and resources. The campaign should raise awareness in the community, specifically through the KCTCS campuses, concerning the economic and community benefits of a sustainable development path, and how entrepreneurship and community led growth are critical to the future of eastern Appalachian Kentucky.

Desired Outcomes

The overarching goal of this campaign is to help citizens take ownership over the future prosperity of their state, understanding the values of sustainability and entrepreneurship as key vehicles to this success. Community led growth is critical to sustainable growth and successful entrepreneurship. Important platforms might include the KCTCS curriculum, local community events, partnerships with relevant NGO's and government entities, places of worship, and local businesses.

Timeline

0-2 Years:

- Approval of Institute
- Research marketing firms
- Contract out marketing campaign to firm
- Seek funding
- Launch campaign

2-3 Years:

- Assess the campaigns success
- Potentially start new campaign

Budget

The KCTCS administration should seek grants as the primary source of funding for the campaign. Currently, KCTCS receives $10,267,500 from private, state and federal grants. KCTCS itself offers program grants that could potentially pay for direct and indirect costs of this campaign. Contracts, external funding, private gifts and endowments, and partnerships should also contribute to campaign expenses.

B. Industry Recommendations

1. Sustainable Agriculture Recommendations

In addition to certificate and degree programs in sustainable agriculture, horticulture, and culinary arts, KCTCS provides a variety of adult and community education opportunities that range from Young Farmers Association to Agricultural Regional Instructors to Returning Vet plots. For our recommendations, we build upon current initiatives and develop new ones. We focus on increasing agricultural capacity and developing markets as the way to sustainable economic development. Scientific research and educational programs for farmers can increase a farm's capacity while food hubs, niche markets, and community gardens increase market access. Initiatives will revolve around introducing new local-oriented business models that promote minimal processing of foods, creating local supply chains for food, and serving institutions in the area both on and around the KCTCS campuses.

Create a Sustainable Agriculture Program at an Eastern Kentucky College

Description

Currently, the Agricultural Technology degree and certificate programs that contain the Sustainable Agriculture track only exist at Henderson, Hopkinsville, and Owensboro colleges, all of which are located in the west of Kentucky. The KCTCS administration should identify a college within the eastern Appalachian region to expand its curriculum and include a similar program, with greater emphasis on the crops and livestock most relevant to the mountainous Appalachian land. This program at the community college can include the development and growth of a student farm or community garden. Somerset College may offer the most viable candidate for this program, as the school already hosts Adult Agriculture Regional Instructors, who currently use the campus classrooms and advise the Kentucky Youth Farmers Association (KYFA). Without a program such as this in eastern Kentucky, it will be difficult to achieve a regional agricultural transition to sustainable farming practices. Engaging and motivating young entrepreneurs and farmers of the next generation will help shape the industry and community for the future.

Rationale

A new Sustainable Agriculture program will allow KCTCS to provide an infrastructure for education around sustainability. This expanded curriculum will fill a gap in the offerings of eastern Kentucky's community colleges. Such an initiative is recommendable given the success of similar regional programs, such as the Farmer Instructor Program and Student Farm at Central Carolina Community College in North Carolina. A related initiative that already exists within KCTCS and can be built upon is a community farm partnership at Southeast Kentucky Community and Technical College (Harlan Daily, 2014). Finally, there is regional demand for professional agricultural expertise, as in 2009, 94,000 people in Central Appalachia worked in the agricultural sector (Rural Support Partners, 2013).

Timeline

This initiative should be planned immediately and implemented in the short term, in order to coincide with recent agricultural initiatives from the government. The program should, however, aim for longevity and flexible adaptation.

Budget

This program would be similar to other tracks that KCTCS currently offers. For the 2013 - 2014 year, tuition per credit hour is $144 for residents, $288 for nonresidents of contiguous counties, and $504 for other nonresidents (KCTCS, 06/14/13).

Measures of Success

Indicators of progress include low faculty turnover, steady or growing student enrollment, and high graduation rate.

Research and Develop a Niche Agricultural Product

Description

The KCTCS faculty can research and develop a niche agricultural product that is a high-quality, differentiated food item likely to succeed commercially in the region. This initiative should link to the Appalachian Proud branding program recently announced this year by which universities research and develop their own particular product. For example, the University of Pikeville created an aqua-ponic system that would use greenhouses to cultivate ginseng, while Eastern Kentucky University is working to reestablish beekeeping on lands reclaimed from coal companies (Comer, 2013).

Rationale

KCTCS can provide the necessary resources and support to conduct research concerning niche agricultural products to help small businesses and local communities to increase their knowledge base in this area. Research on niche agricultural products can further be operationalized into specialized training for farmers and distributers. Community colleges have expertise in the local area and are thus situated to provide accessible information for concerned farmers.

Timeline

The timeline for this initiative is also short-term, approximately 0-2 years, as it should capitalize on the launch of the new Appalachian Proud branding program.

Budget

The US Department of Agriculture offers grants for farmers looking to develop value-added products, and this funding might prove beneficial for farmers in eastern Kentucky (USDA, 03/26/2014). The Kentucky Department of Agriculture's Office of Agriculture Marketing and Promotion offers grants and funding (KYDA, 2014). Other sources of funding include Seed Capital Kentucky, the Eastern Kentucky Food Systems Collaborative, and SARE.

Measures of Success

Progress indicators include faculty and student interest in the subject, research reports written and published, product development, volume produced and sold, events held and partnerships established.

Expand Farm-to-Campus Program to KCTCS

Description

The KCTCS administration should contract local farmers to provide fresh produce for food-serving institutions on and around KCTCS campuses in an effort to expand existing Farm-to-Campus Programs. In 2013, the Farm-to-Campus program launched at University of Louisville, Centre College, Eastern Kentucky University, Northern Kentucky University, and Western Kentucky University. Working with food service partners, these five universities have identified local food sources for campus dining facilities and convenience stores (Aldridge, 2013).

Rationale

The KCTCS campuses should integrate institutional support of the local and regional food systems, which they are seeking to advance in the classroom. This should align with the recent Sustainable Community Garden program that Arlie Boggs Elementary School and Southeast Kentucky Community and Technical College recently initiated in partnership (Harlan Daily, 2014).

Timeline

The process for developing and implementing this program should be shorter term, given the model already exists in surrounding universities and only needs to be adapted to the KCTCS institutions. The KCTCS leadership should evaluated and revise the program each year to improve efficiency and consumer satisfaction. KCTCS should also consider expanding the range of types of food or agricultural products offered on its campuses over time.

Budget

Southern SARE provides research and education grants up to $300,000 for three years, to institutions that conduct research into agricultural systems (Southern SARE, 2012). Additionally, the Central Appalachian Network provides small grants, technical assistance, and training to support local food businesses. The cost for sourcing food from local farms should not exceed the cost of

current food sourcing; rather, it can be expected to cost less, given that the model establishes a more direct supply chain.

Measures of Success

Success will be measured according to whether the Farm-to-Campus programs are implemented, their implementation and expansion results in cost savings, and the satisfaction of customers at food businesses and farmers supplying food products increases. It is recommended that KCTCS first implement Farm-to-Campus at select colleges, and then expand the initiative to include all KCTCS campuses in eastern Kentucky.

Expand Adult Agriculture Regional Instructor Program

Description

The KCTCS administration should expand the existing Adult Agriculture Regional Instructor Program to one or more college campuses in the Appalachian region of Kentucky.

Rationale

Continuing education for current farmers is an important aspect of agriculture education because it can increase the incomes of family farms and thus strengthen the local economy (KYAC, 2013). Through understanding the best practices taught by program instructors, farmers will obtain important knowledge that will allow them to make sound decisions and investments. Most farms are family enterprises and increasing the working knowledge of best agricultural practices can increase even a small farm's production capacity when space is limited (KYAC, 2013).

Timeline

Given the program already exists within the KCTCS curriculum, expanding positions to new colleges should not take more than one to two years, including the initial assessment of greatest campus suitability and community need.

Budget

Costs of expanding the program will include wages for new agriculture instructors, transportation costs for consultation services, administrative costs, and marketing and event costs.

Measures of Success

Indicators of success will include both quantitative and qualitative measurements. Quantitative measurements will include the number of farms the instructors visit, the number of farmers reached by the newsletter, and the number of farmers who visit campus to attend on-site training, while

qualitative measurements will examine student and farmer satisfaction with the program and instructor evaluation of program impacts.

Create Local Food Hubs

Description

A food hub is an organization that can fulfill retail demand by actively managing the distribution, supply, and marketing of source-identified food. This initiative would dovetail with the Appalachian Proud branding and niche agricultural product development initiatives to create product differentiation. Not only providing services to producers and suppliers, food hubs also benefit the community by increasing awareness of local food, reducing food deserts, and providing youth employment opportunities (Barham et al., April 2012).

Rationale

Food hubs will address the current limited amount of market options, distribution networks, and infrastructural barriers due to competition with wholesale retailers and lack of aggregation of small or mid-sized producers. They will also meet a current need for a single entity to unify regional (Appalachian-wide) and local (Eastern Kentucky-wide) initiatives. The current need for community engagement programs including partnership with food advocacy groups & CSAs surrounding local food is a primary reason for the creation of local food hubs. This initiative would dovetail with the Appalachian Proud branding and niche agricultural product development initiatives to create product differentiation. Food hubs also benefit the community by increasing awareness of local food, reducing food deserts, and providing youth employment opportunities (Barham et al., April 2012).

Timeline

The development process of this initiative should be short term, approximately one to two years, as it requires the coordination and pooling together of existing resources rather than creation from the ground up. The program should be implemented for the long-term.

Budget

A local food hub should not incur any added costs to the University, as the organization is run on the support of volunteers and non-profit organizations. The Governor's Office of Agricultural Policy (GOAP) in conjunction with the Kentucky Broadcasters Association's Public Education Partnership (PEP) Coordinated Communications Outreach Program offers a potential source of financial support. Additionally, the National Food Hub Collaboration identified 30 federal grant programs that will fund food hubs by providing money for planning, equipment needs, capital, training, and other required resources through agencies such as the United States Department of Agriculture (USDA), HUD, and the Department of Commerce. Please refer to pages 35 to 44 of USDA's Regional Food Hub Resource Guide for greater detail (Barham et al., April 2012).

Measures of Success

Success will be measured by the implementation of local food hubs, the scope and breadth of participants, and the resources made available via the new food hubs. Food hubs should benefit all residents of the community. The success of these hubs in meeting their targets and the impact to local residents can be measured via customized community assessments, including interviews and surveys. These should be structured so that hubs can adjust their functions based on community inputs in order to best serve the community.

2. Environmental Remediation Recommendations

The section of the Workshop Team examining the environmental remediation industry aims to help KCTCS advance sustainable economic development in eastern Kentucky through centralizing and mobilizing significant resources within the system and eastern Kentucky for overcoming challenges related to the coal industry and environmental remediation. KCTCS is a key player in using these resources to drive economic growth, sustainable development, and entrepreneurship in eastern Kentucky, because of its clear vision in supporting sustainability and establishing successful networks.

The Workshop Team identified entrepreneurial and educational models according to community fit within the reclamation industry, and has aggregated suggested initiatives under the umbrella of one single recommendation that can best serve the KCTCS colleges and the community more broadly. This recommendation is highly detailed and more complex than the individual recommendations that are a part of the suite of recommended initiatives within the sustainable agriculture industry and for the KCTCS institutions.

Establish the KCTCS Mining Reclamation Interagency Working Group

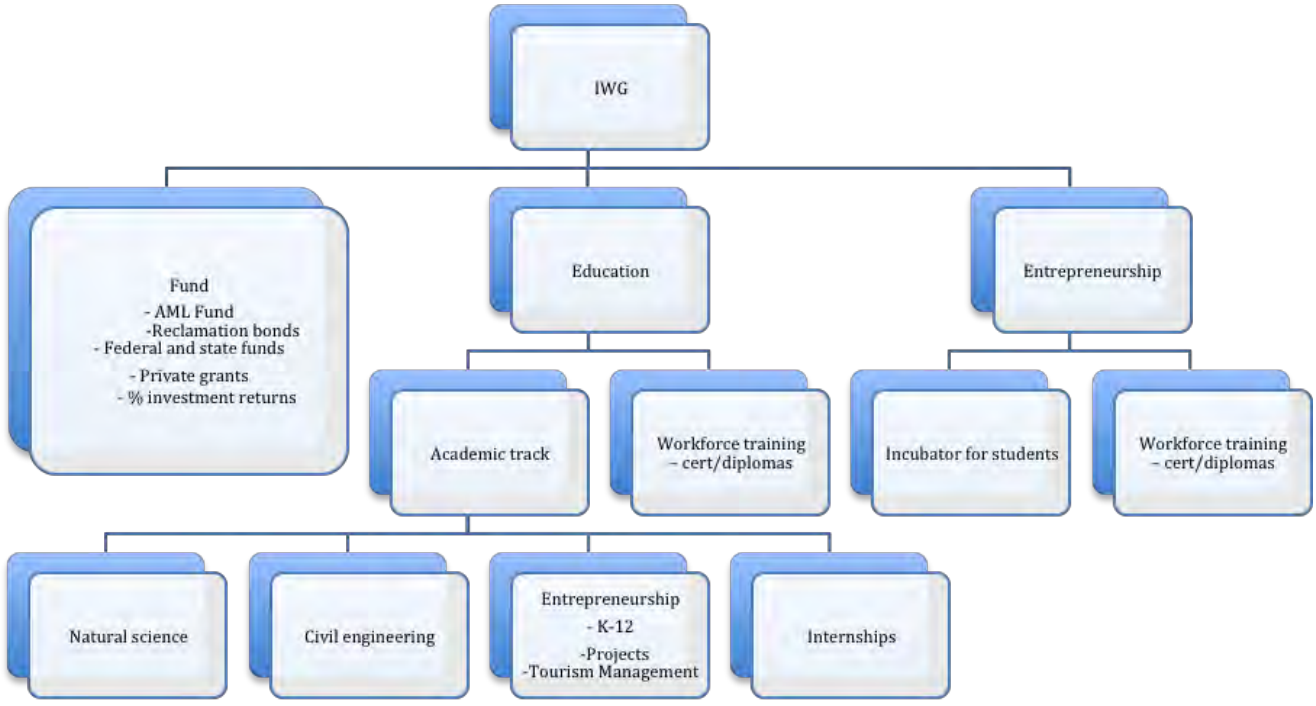

***Figure 3**. Organizational Structure of Mining Reclamation Interagency Working Group.*

Description

KCTCS should establish a Mining Reclamation Interagency Working Group (IWG) to pursue potential collaboration among entities that share similar objectives for advancing sustainable economic development. These entities might include the University of Kentucky (UK), the Earth Institute (EI) at Columbia University, mining companies, private landowners, agricultural companies, the tourism industry, community organization partners, the Office of Surface Mining Reclamation and Enforcement (OSMRE), and related government agencies. Together, these various partners could create and implement education and entrepreneurship initiatives in mine reclamation.

Figure 1 suggests a possible structure for this IWG, which might consist of three bodies: a fund, an education committee, and an entrepreneurship committee. This structure would help the IWG members to strategically plan and implement educational and entrepreneurial initiatives, as well as

manage the common Fund.

Should such a partnership develop, KCTCS, UK, and the EI could spearhead an educational effort to pool their academic and research expertise to create an interdisciplinary mine reclamation track in Big Sandy College's Civil Engineering Technology program. As an example, KCTCS could build upon its current programs in Civil Engineering Technology program, Surveying and Mapping Technology, and Environmental Science Technology, while UK could build upon its current programs in Civil Engineering, the natural sciences, tourism management, and the FRA. EI could then share its expertise on Sustainability Management, and Environmental Science and Policy.

Courses could include both the natural science and technology aspects of mining reclamation, as well as the entrepreneurship aspect, for a holistic approach. KCTCS, UK, and EI could tailor the courses to industry needs by liaising with industry partners in the IWG. Table 2 lists current course offerings in the above three institutions that could form the foundation of the mine reclamation track curriculum.

Table 2. *Current Related Course offerings in KCTCS and the University of Kentucky.*

Course	Institution
Hydrology and Drainage	Big Sandy
Land Surveying Graphics	Big Sandy
Freshwater Invertebrates	Bluegrass
Pollution of Aquatic Ecosystems	Bluegrass
Hydrological Geology	Bluegrass
Soil and Hazardous Waste Management	Bluegrass
Environmental Law and Regulation	Bluegrass
Watershed Sedimentation	UK
Introduction to Stream Restoration	UK

GIS Applications for Water Resources	UK
Forest Ecology	UK
Wildlife Biology and Management	UK
Landscape Management and Arboriculture	UK
Natural Resources and Environmental Policy Analysis	UK
Tourism and Planning Development	UK

The education committee could also partner with mining companies, K-12 programs, and community organizations to train students to apply their skills in the real world, instill in them an entrepreneurial spirit, and facilitate collaboration in student-led fieldwork projects. For example, the IWG could work with mining companies to help students gain internship opportunities, or schools to help potential student entrepreneurs tap upon youth's enthusiasm for fieldwork. In these examples, KCTCS could leverage upon its existing workforce and community outreach programs, such as Kentucky Coal Academy, Maysville's agricultural and horticultural partnerships, Somerset's GEMS and G2TECS, as well as Southeast's Project Lead the Way. Possible community partners also include Kentucky Water Watch, Kentuckians for the Commonwealth, and Appalachian Voices.

In addition, the community colleges could work with UK's Cooperative Extension offices for Forestry and Agricultural Extension Services, as well as for Community Outreach. One potential partnership would be with the University's 4-H youth development program that is based in every county and aims to involve youth in issue of concern. This program is also a key partner to incorporate the material into K-12 curriculum. The education committee could also provide workforce solutions for existing workers in the mining industry to gain skills in mine reclamation, such as mining safety and HAZWOPER 40 hour training, through existing resources like the Kentucky Coal Academy and Kentucky Safety Training Institute at Southeast Community College.

As for the entrepreneurship committee, KCTCS could collaborate with the other IWG members to help recent graduates and existing workforce members pursue entrepreneurship in mine reclamation. If possible, the IWG could target recent graduates through a business incubator, and develop

certificates for workforce members that complete entrepreneurship training. These efforts could build upon existing entrepreneurship resources, such as KCTCS's Entrepreneur Center (Maysville), Small Business Development Center (Southeast), Pine Mountain Community Development Corporation (Southeast), and Office of Business and Industry Services (Southeast); as well as UK's von Allmen Center for Entrepreneurship and iNET.

In addition, the Earth Institute might be able to share its expertise to jointly design and develop sustainability certification standards for entrepreneurship with the other IWG members, such as its Certificate in Conservation and Environmental Sustainability, and Certification in Sustainable Water Management. The OSMRE could then ensure that these standards comply with federal and state regulations. If these efforts are successful, certified mining companies within the IWG could act as mentors to others, which in turn could then join the IWG after reaching certification standards.

Compensatory mitigation is one possible area of focus for the business incubator and workforce training, as it could help mining companies restore degraded streams and wetlands to offset their ecological impacts on these ecosystems. Currently, mitigation banking investors provide mining companies with efficient, high-quality mitigation services, which will help reduce their permit processing time and provide them with higher certainty. One example is Ecosystem Investment Partners (EIP) that has acquired over 5000 acres of land in eastern Kentucky under the Eastern Kentucky Stream Mitigation Bank (EIP, 2010b). By generating a large credit supply through mitigation, EIP sells these credits to landowners and delivers returns on these investments to its investors (EIP, 2010a). Next, Kentucky Department of Fish and Wildlife Resources currently administers the Kentucky Wetland and Stream Mitigation "Fee In-Lieu of" (FILO) Program, in which mining companies pay the Fund a fee for helping them mitigate their impacts when applying for mining permits (Moore, 2011, p. 195). This also helps the mining companies generate credits for future mining activity. The EIP and the Department could play active roles in the entrepreneurship committee, by grooming entrepreneurship students and assimilating them into their workforce later.

Another possible area of focus for entrepreneurship training is developing the reclaimed sites into economically valuable recreational, tourism, and agricultural lands, using native plant and wildlife species of civic significance to the Kentucky Appalachian region. Stakeholders from the above sectors could play an active role in forging entrepreneurship training in the IWG. One example is

the Monday Creek Restoration Project, which was founded by a group of community members committed to restoring Monday Creek in the Appalachian region of southeastern Ohio. The Environmental Protection Agency declared the Creek unrecoverable in 1990, due to extensive damage done by acid mine drainage after a century of coal mining. After the residents formed the group in 1994, it since expanded to include more than 20 partners, who included universities, grassroots organizations, State offices, the Forest Service, the Environmental Protection Agency, and the Fish and Wildlife Service. These partners were critical to sharing their unique technical expertise in stream sampling, cleanup design, management planning, and Geographic Information System analysis. Community members have even painted a mural that depicts the history of coal mining in the local area, and this has increased community pride. These efforts have since improved water quality and the Monday Creek watershed is even suitable for recreation (Department of the Interior, 2007).

KCTCS currently offers programs that promote awareness of the local Appalachian culture, such as Hazard's Kentucky School of Craft, Kentucky School of Bluegrass and Traditional Music, and Appalachian Studies program, as well as the Godbey Appalachian Center. These programs will be useful resources for training entrepreneurs to respect local culture.

Rationale

Mine reclamation has the potential to spur re-growth and reorganization of eastern Kentucky, through the achievement of multiple sustainability objectives at once. Mine reclamation integrates ecological, economic, and social well-being, which aligns with KCTCS sustainability framework. Not only do the remediation efforts improve ecosystem structure and function, they also spur economic development through real estate, outdoor recreation, and tourism, as well as increase community pride by forging attachment toward the land.

Mine reclamation is important to eastern Kentucky because the region has rich natural heritage. The lack of glaciation over this region during the last ice age has made it one of the most bio-diverse regions in North America. Today, however, 60 of the 690 vertebrate species and 83 of the 2245 native plants found in the area are endangered or threatened, primarily due to logging and mining activities (Rouse and Greer-Pitt, 2006). On top of that, local residents and officials in both Pike and

Bell counties see mine reclamation as a solution to meeting unmet demand for real estate development. Currently, the hilly topography of eastern Kentucky limits development for housing, recreational facilities, manufacturing, retail, and other industries. According to local business leaders, only 15% of the land in Pike County is suitable for development. More than 50% of survey respondents in Pike County felt that the existing housing supply was inadequate in meeting demand (Ezzell, Lambert, and Ogle, 2012). Mine reclamation encourages sustainable growth by building skills that are transferrable to the construction and engineering industries, which would be vital to real estate development once mine reclamation has occurred. Mine reclamation is feasible because Kentucky has the necessary vital resources such as community spirit, pride concerning the land, a culture of outdoor recreation, college curriculum in the natural sciences and engineering, as well as community networks like UK's cooperative extension system.

The mine reclamation IWG is suited to achieve the above objectives effectively, because it will provide an infrastructure for sustainable education, research, development, and access to capital for small businesses. Through a decentralized, collaborative framework, stakeholders can share funds, resources, and talent in a cost-effective way, and achieve their otherwise conflicting objectives through effective communication. For example, graduates of the mine reclamation track in Big Sandy's Civil engineering Technology could move on to pursue a four-year degree in Mining Engineering at UK. Mentoring can also occur among mining companies to achieve certification standards and improve marketability. In addition, mining companies that train students in mine reclamation and entrepreneurship will in turn benefit by retaining their talent in their workforce. This provides a self-sustaining mechanism for the IWG framework. KCTCS is poised to lead the IWG, because its acts as a bridge between the four-year college system and the Kentuckian community, and has the potential to use UK's cooperative extension system to implement bottom-up change.

Next, the IWG will encourage communities and economies to embrace an entrepreneurial culture in mine reclamation, by equipping students and workforce members with essential skills in a safe, structured environment. This is necessary to raising self-efficacy of potential entrepreneurs, and cultivating in them positive attitudes toward mine reclamation. Currently, curricular gaps exist in KCTCS in terms of course offerings that are relevant to mine reclamation, as many programs of study do not prepare students for the trade holistically. While the six community colleges offer

courses that are relevant to the engineering and technology aspects of mine reclamation, other equally important courses related to horticulture, agriculture, Geographic Information Systems, and Environmental Science Technology are offered through other community colleges in KCTCS (KCTCS, n.d.). The six community colleges could tap upon these resources of wider KCTCS through the IWG.

According to the Office of Personnel Management (n.d.), a Surface Mining Specialist should be trained in the following fields: hydrology, agronomy, geology, range conservation, forestry, ecology, civil engineering, mining engineering, natural sciences, biological sciences, natural resources, environmental planning, or earth science. This occupation should also have general experience in flood control projects, erosion control, wildlife and endangered species surveys, market valuation of forestland, assessment of water chemistry and pollutant treatment, and the evaluation of geologic conditions. This occupation should have specialized experience in analyzing the problems and effects of surface and underground mining, communicating technical information effectively, and reading and interpreting maps and technical reports.

Lastly, the mine reclamation IWG helps identify small business support models based on community fit, by promoting the development of land in the spirit of civic ecology practices. According to Krasny and Tidball (2012), these practices are self-organized stewardship practices that help communities demonstrate resilience toward ecological disturbances, in this case, environmental degradation due to mining. These practices come in the form of community gardens, urban forestry, and species reintroductions. Notable examples are New York City's High Line, Chicago Wilderness Prairie Restoration Project, and Rocking the Boat's oyster restoration in the Bronx. These practices reflect local culture and character of the built and natural environment, and foster psychological, social, and physical well-being. To ensure community fit, the IWG will incorporate education about local Appalachian heritage, and involve community members in the planning of business strategies.

Desired Outcomes

The desired outcome of the mine reclamation IWG would be to provide stakeholders with a collaborative platform for advancing mine reclamation. This will hopefully encourage KCTCS students to pursue mine reclamation as a career, encourage existing workforce members to initiate

entrepreneurship activities around mine reclamation, increase community awareness of the issue, and raise funds for it.

Timeline

The following is a suggested timeline for the establishment and implementation of the IWG:

0-3 Years:

KCTCS could spend the first three years implementing a pilot program for self-evaluation and adaptive learning. It would first need about 6 months to liaise with different stakeholders and establish the IWG. Priority should be given to educational institutions and mining companies, which are essential parts to establish the pilot program. After the successful establishment of the IWG, KCTCS should take another 6 months to coordinate with the IWG members to gather resources, funds, and equipment for the pilot program. During this period, the IWG should purchase basic equipment, and institute key appointments. The IWG should start enrolling students by the end of the first year. After the next two years of operation, the IWG should conduct a comprehensive evaluation to measure the success of the pilot program.

3-6 Years:

As the program matures, the IWG should transition from managing the pilot program to expanding its scale. More stakeholders such as regulatory agencies and sustainability initiatives should be incorporated into the IWG. At the same time, the Fund should aim to eliminate deficit by increasing revenue through fund-raising contributions. Before the end of the 6th year, the IWG should become financially sustainable. During these 3 years, the IWG should publish annual reports to review its financial performance and objectives. It would then be able to decide if it could consider expanding the mine reclamation track into a full associate's degree program.

6-9 Years:

The IWG should look to include more stakeholders that can promote economic growth and sustainability, such as the tourism, recreational, and real estate industries, and expand its reach into these industries. The IWG should be fully mature by the end of these 3 years, and should start generating returns.

Budget

In 1977, Congress passed the Surface Mining Control and Reclamation Act, which mandates remediation efforts after mine closure. The Act established the OSMRE, which oversees industry compliance and makes sure that remediation projects are properly performed. However, under certain circumstances, such as bankruptcy, such remediation efforts are often not possible. In addition, several mining sites were abandoned before the act was passed. The OSMRE creates the Abandoned Mine Land (AML) Fund to pay for remediation for AML. The AML fund is financed through a tax imposed on every ton of coal production, which is also known as reclamation bonds. Since its creation, AML fund has become the dominant source of funding for remediation project nationwide (Bureau of Land Management, 2014; Kentucky Energy and Environment Cabinet, 2011), and could be a major funding source for Kentucky's mine reclamation efforts.

In addition, with Eastern Kentucky being designated as promise zone, the state enjoys priority consideration when applying for federal grants. This will hopefully increase funding for remediation projects in the study area. The creation of the Eastern Kentucky Coal Area Recovery Commission (CARE) would also ensure easier access to federal and state funds, and financial sustainability in the future (Office of Kentucky Governor Steve Beshear, 2013). Further grants could also come from private organizations dedicated to higher education in the US like the Lumina Foundation. Lastly, a portion of funding could come from investment returns generated by the private companies in the IWG.

We calculated the following estimated budget for the pilot academic track based on KCTCS 2013-14 salary schedule. We assume the pilot program would require hiring three new professors and five staff members, while the creation of an associate degree would require eight professors and ten staff members.

Table 3. *Estimated Budget for IWG*

	Academic Track	Associate Degree
Professor Salaries	$252,000	$672,000
Staff Salaries	$300,000	$600,000
Initial Equipment	$20,000	$50,000
Total	$572,000	$1,322,000

Measures of Success

KCTCS should measure the success of its mine reclamation efforts quantitatively and qualitatively. Quantitative performance indicators should include student enrollment, post-graduation employment statistics, the number of small businesses developed by students, as well as environmental factors such as the number of mines reclaimed and stream quality of mined areas. Qualitative indicators should include student satisfaction and industry feedback. Data collection should also be a collective effort by the IWG members. KCTCS will measure most student-related indicators, while industry and government regulatory agencies will measure environmental and economic indicators. Methods of collection should include surveys, interviews, and self-reports. KCTCS will collate the data and publish annual reports on the IWG's performance.

VII. Conclusion

Significant resources already exist in eastern Kentucky for sustainable development in response to economic challenges. The Workshop Team recommends that the KCTCS administration focus on resources within the industries of agriculture and mine reclamation, as they are central to the local culture of Kentucky's Appalachian region and key to building resilience. Specifically, we recommend capitalizing on existing curricula in civil engineering and agriculture, local markets, as well as federal- and state-level initiatives around entrepreneurship. By acting as the hub of education, economy, and community, KCTCS has the potential to affect bottom-up change by organizing existing resources within innovative frameworks and encouraging participation in the identified industries.

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