



PennState
College of Agricultural Sciences



Institute for Sustainable Agricultural, Food, & Environmental Science (SAFES)

A BLUEPRINT FOR A RE-IMAGINED
COLLEGE OF AGRICULTURAL SCIENCES INSTITUTE

SEPTEMBER 2019

Executive Summary

The **Institute for Sustainable Agricultural, Food, & Environmental Science (SAFES)** is envisioned as the College of Agricultural Sciences interdisciplinary research institute formally affiliated with Penn State Institutes of Energy and the Environment (IEE). SAFES will be an integrated platform for researchers across the college to develop decision support and policy innovations with a diverse group of stakeholders through landscape-level analyses and predictive modeling.

The institute will be built on a framework of **the science of agricultural sustainability**.

Organized as a college-level institute, SAFES will provide a coordinated program infrastructure that will accelerate and advance current efforts to promote successful collaborations and amplify impact. By integrating these efforts across the college and university, researchers will be able to more effectively **collect** large sets of empirical data at the scale of landscape experiments, **analyze** and **create** predictive models, and **discover** and **share** sustainable policy options, business management solutions, and best practices that impact food security, environmental protection, and the prosperity and amenities of communities.

science of agricultural sustainability

integration of natural and social sciences to inform practice and policy for productive, working landscapes, healthy watersheds, and resilient economies

Because this science-to-practice framework requires dynamic coordination of research, education, and outreach, SAFES is organized into three integrated program areas: Research Programs, Educational Programs, and Partnerships and Engagement. The Director oversees the integration of these areas, each led by an Assistant/Associate Director and advised by specialized committees. Undergirding this organizational structure, five strategic priorities will guide the initial growth and continued development of the institute:

1. build and sustain a community of researchers
2. provide a technical infrastructure
3. coordinate partnerships and engagement
4. extend and integrate education
5. support a unified communication strategy

From watersheds to forests to crops and animal facilities, the institute's research will emphasize the productivity, resilience, and regeneration of agricultural and natural landscapes as solutions to some of the most vexing problems confronting Pennsylvania as well as landscapes worldwide. SAFES will serve as the unifying umbrella for college researchers and their colleagues under which they can holistically and comprehensively understand and address these critical issues at the landscape level.

PURPOSE / VISION

addressing complex landscape-level challenges by channeling scientific research into solution-oriented policy, business, and practical innovations

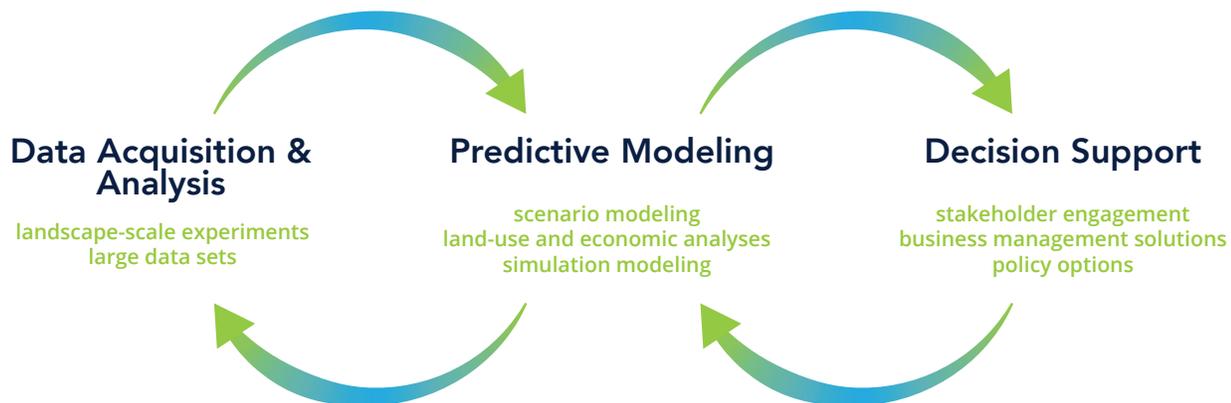
MISSION

to provide a synthesizing science-to-practice platform for a collaborative community of researchers and stakeholders in discovering responsible and sustainable policy options, business management solutions, and best practices

Idea Development

Under the Environment and Natural Resources Institute (ENRI), established in 2005, researchers in the college established a strong foundation for the future of the institute. ENRI's focus on interdisciplinary policy-relevant research and innovative public engagement strengthened the capacity of public decision makers in developing effective, efficient, and sustainable strategies to reduce nutrient and sediment pollution. Since 2008, ENRI has led initiatives, such as *Agriculture in Balance*, in which scientists, policy makers, agricultural industry leaders and producers, and environmental leaders collaboratively developed a vision for the future of Pennsylvania's agriculture. These initiatives set the tone and laid the groundwork for significant community engagement to solve complex environmental problems and achieve on-the-ground results, serving the college, the university, and the citizens of Pennsylvania. Water quality will remain a priority for SAFES, but to fully achieve the potential for this college-level institute, the scope of research and engagement must expand ENRI's current activities to embrace a broader range of expertise in the college in order to address the complex challenges of sustaining resilient, productive, and multi-functional landscapes.

The vision for the future of the college's institute laid out in the Executive Summary is the product of an iterative process started in Spring 2019 that included college leadership and key faculty participants across a range of disciplinary expertise and at different stages of their careers. Synthesizing the input received from this group through a series of meetings and virtual communication, a science-to-practice framework was conceptualized (see diagram below), which became the underlying structure for the purpose and mission of SAFES.



In early June 2019, a group of approximately 40 faculty members were invited to participate in a one-day facilitated workshop to focus on building and sustaining a community of researchers to do this work. The objectives of the workshop were (1) to envision the untapped potential of research intersections, (2) to explore “enabling” tools and expertise to facilitate interactions, and (3) to bring these ideas into conversation with one another. During the workshop’s breakout sessions and panel discussions, participants identified several strategies to address the objectives, which fall into the following broad categories: infrastructure, support staff, technical facilitation, incentives/rewards, communications and outreach, and resources. These ideas are the basis of the “Strategic Priorities” defined below.

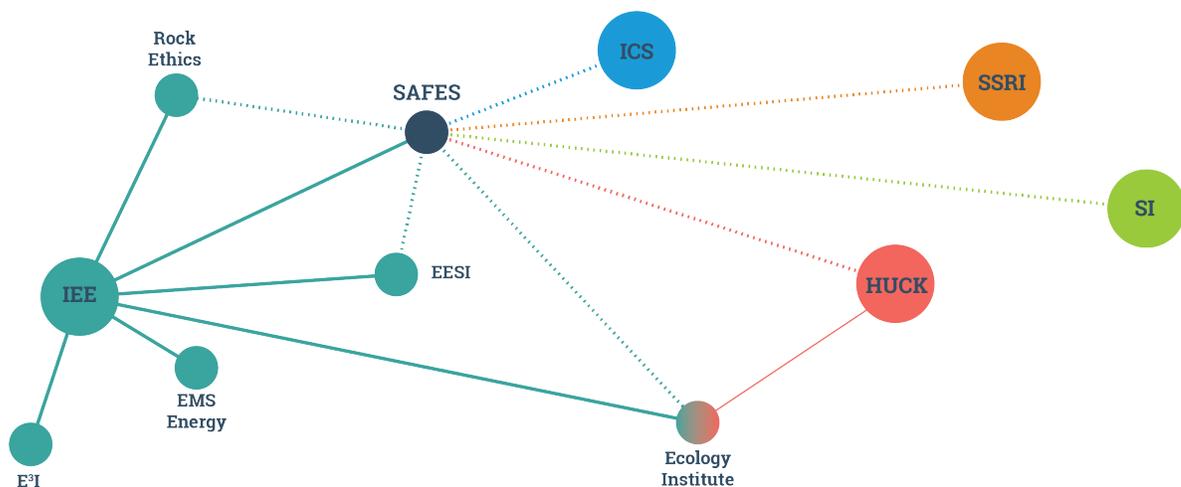
Ultimately, it was agreed that the institute will serve as a gathering place for researchers and stakeholders to incubate and explore innovative research problems that require diverse teams across all departments in the college. SAFES will provide a collective framework and identity that allows for structured proximity and exposure to related work across disciplinary boundaries, thus building the potential for advancing systems-level research at varying scales and across different sectors.

Penn State Strategic Partnerships

Penn State strongly supports collaborative research at the university level by investing in interdisciplinary institutes that promote research across colleges. The **Penn State Institutes of Energy and the Environment (IEE)** is one of these institutes organized under the Office of the Vice President for Research. SAFES succeeds the Environmental and Natural Resources Institute (ENRI) as the College of Agricultural Sciences institute affiliated with the IEE and is comparable to its sister college-level institutes—**Earth and Environmental Systems Institute (EESI)** in the College of Earth and Mineral Sciences; the **EMS Energy Institute** also in the College of Earth and Mineral Sciences; the **Engineering, Energy & Environmental Institute (E³I)** in the College of Engineering; and, **The Rock Ethics Institute** in the College of Liberal Arts—each embracing the mission of IEE to build partnerships and new ways of thinking that address the world’s energy and environmental challenges.

SAFES benefits from IEE’s centrally provided resources such as the cross-college network of researchers, the Seed Grant Program, and the facilities and instrumentation (including the Accelerator Mass Spectrometer Lab and the Water Quality Lab). SAFES complements the work of other institutes across the university as well, such as the **Ecology Institute**, which bridges IEE with another of the university-level institutes, the **Huck Institutes of the Life Sciences**. The Ecology Institute brings together disciplines in geosciences, geography, sociology, ethics, policy, decision analysis, economics, landscape architecture, and anthropology in support of the Huck’s vision to seek understanding of the processes of life, health, and food.

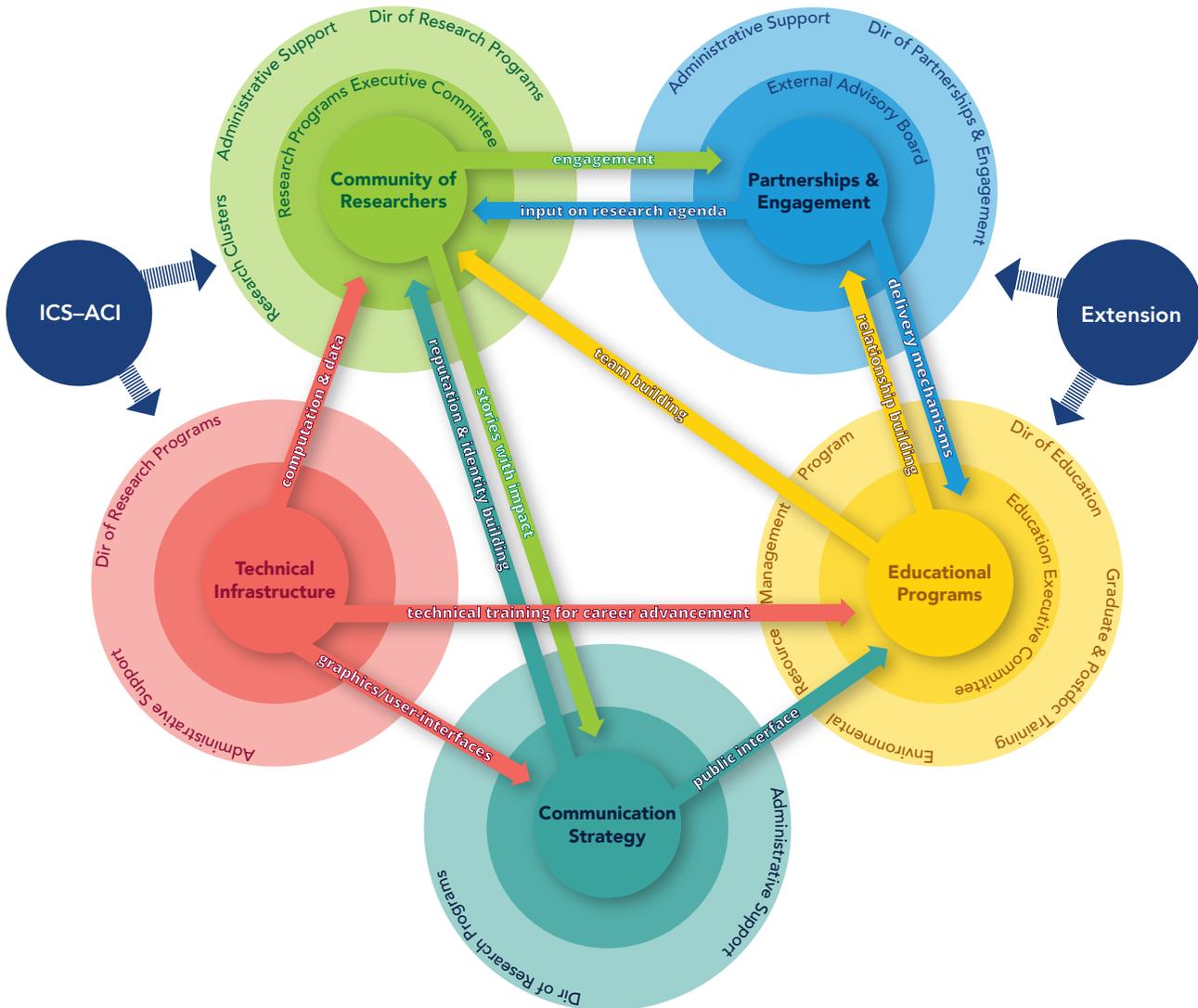
The scope of SAFES opens additional opportunities to engage with other interdisciplinary institutes of the university as well. For example, the **Institute for CyberScience** is the gateway for increasing the technical and computational capacity of SAFES, but there is also potential for building future collaborations around data management questions that will inevitably arise with increased data collection and sharing across institute members’ projects. Expertise in the **Social Science Research Institute** may help to guide survey design or consultation on statistical issues related to social science research. And, the **Sustainability Institute** is an important partner in connecting SAFES to the broader university goals as they are laid out in the Penn State Strategic Plan, thus contributing to the aim of situating Penn State as a leader in sustainability.



The transdisciplinary foundations that underpin the strategic priorities laid out in the following sections characterize the nature of much of the research across the College of Agricultural Sciences and indicate how essential these inter-college collaborations are in accomplishing the mission of SAFES.

Strategic Priorities

The Strategic Priorities for the future of the college's institute support the vision for SAFES by assigning action to the purpose and mission stated in the Executive Summary. These priorities are summarized here with expanded descriptions in the following sections.



1. **Build and sustain a community of researchers.** The pursuit of complex landscape-level questions necessarily requires the collaboration of experts across different disciplines as well as technical skillsets. The activities sponsored by SAFES facilitate and support multidisciplinary team science by providing a central gathering place for investigators to more effectively do the following:
 - a. discover and exchange related research and knowledge across the college
 - b. experiment with new collaborative structures
 - c. coordinate research agendas and share data
 - d. explore and develop new research questions
 - e. collaborate on proposals in response to external funding opportunities

- 2. Provide a technical infrastructure.** In order to address the landscape-level challenges identified under the structure of SAFES, collaborative teams need adequate computational capacity along with secure and accessible solutions for data management and sharing. Likewise, the skill and expertise to conduct research syntheses and analyses and create effective data visualization tools and user interfaces is integral to the outreach and communication strategies.

The institute will provide support by coordinating with university-level resources to connect researchers with computational and graphic expertise as well as to build a technical infrastructure that is stable while at the same time allows for innovation and expansion.

- 3. Coordinate partnerships and engagement.** A critical contribution of the institute is to engage a broad range of stakeholders and decision makers in the collaborative co-production of knowledge. Participatory research with stakeholders through a shared discovery approach ensures that research questions and design are relevant to decision makers and that dissemination of research outcomes results in innovative, solution-oriented implementation.

The institute is the coordinating hub for building critical partnerships with key thought leaders, decisions makers, and practitioners across diverse sectors and scales as well as engaging these stakeholders to gather input and advice, foster aligned research agendas, and transform science to solutions.

- 4. Expand and integrate educational programs.** Ultimately, the implementation of research findings will be a strong indication of the impact achieved by the institute's research programs. Education is an essential tool in successfully disseminating the potential of the institute's contributions.

The institute administers an integrated effort focused on education that supports the science-to-practice vision of the institute by training a future generation of transdisciplinary scientists, educators, decision makers, and practitioners through dynamic and transformative methods of learning including through classroom-, field-, and lab-based experiences, participation in collaborative, multidisciplinary research, experiential learning and study abroad, stakeholder and community engagement, and internships to enhance professional training and networks.

- 5. Support a unified communication strategy.** Consistent and impactful messaging is essential for providing researchers with a collective representation within the university community and for establishing a public-facing identity for the institute. The dissemination of solution-oriented research findings focuses on the impact and mutual benefits afforded by the science of agricultural sustainability.

The institute is a centralizing asset by circulating accomplishments on a regular basis, placing the work in front of funding agencies and stakeholders, and thus promoting a national reputation for the community of researchers.

Priority 1: Build and Sustain a Community of Researchers

At the core of the institute is an emphasis on team science as a pathway to transfer and communicate potential solutions to the wicked problems addressed by the science of agricultural sustainability. Across the college, researchers have developed inventive methods for integrating their research into an engagement strategy. Their successes demonstrate an effective readiness within the college to launch an integrated effort by the institute.

Under the cooperative leadership of the **Institute Director** and the **Assistant/Associate Director of Research Programs**, the institute furthers this work initiated by college faculty by providing key support in forging new collaborations as well as fostering on-going projects through the networks and activities of the institute's research clusters.

Clusters

The research clusters allow for amorphous boundaries with varying degrees of intensification and experimentation in the collaborative structures that define them. Thus, the activities of one cluster may interact with those of another, promoting unexpected exchanges of knowledge and the intensification of research depth.

Research clusters formed under the institute are **multidisciplinary sub-communities of investigators** with a **binding common interest** centered on **solution-oriented inquiries**.

Institute activities are organized at the research cluster level. Each cluster designates one **delegate** to serve on the executive committee and to spearhead the cluster's community-building activities. This person is also a liaison, working closely with other cluster delegates and the **Assistant/Associate Director of Research Programs** to maintain intercommunication within the institute and to ensure the porous qualities of the cluster model.

Because of the nature of these fluid networks, institute members may identify with one or more cluster. Likewise, existing and newly forming centers or initiatives may be associated with multiple clusters since the research underpinning these collaborations often addresses a number of interdependent and related challenges. The benefits afforded by the cluster model will fundamentally be to provide a collegial framework for stimulating collaborations, to develop bigger strategies for addressing wicked problems, and to more effectively share data (including knowledge of existing datasets) across disciplines and expertise.

Support for Team Science

The sophisticated incorporation of natural and social science is a strength of the college already, as evidenced in a number of large-scale, externally funded projects that address critical issues such as nutrient pollution, pollinator health and conservation, and weather-related variability and change. The institute affords the opportunity to further cultivate these interdisciplinary exchanges as well as increase the potential for innovative, unforeseen solutions by expanding disciplinary boundaries to also embrace design, arts, and engineering.

This multidisciplinary approach requires consistent support for repeated interactions among institute members and the university at large, including regular sessions for sharing current projects and facilitated discussions that identify common research problems. The **Assistant/Associate Director**

SAFES provides a common framework for scientists across the college to **foster existing collaborations** and to **build new ones** in the pursuit of **integrating knowledge across disciplines**.

of Research Programs is the operational nucleus for these activities and support. With a comprehensive working knowledge of the members' research programs, this person is able to connect researchers to one another within and beyond the college, nurture the potential for new collaborative projects, and to strategize future funding possibilities.

The **Assistant/Associate Director of Research Programs** also supervises a **Program Assistant** devoted to the coordination and management of grants affiliated with the institute's members. The Program Assistant provides specialized, high-level grant support, regularly seeking relevant funding opportunities, facilitating the application process, and managing the opportunities that come to fruition (including post-award support such as subawards, graduate assistantships, setting up cost centers, and support for grant reporting requirements). The Program Assistant coordinates with the Penn State Strategic Initiatives Research Office (SIRO) and the College Office of Grants and Contracts (OGC) to ensure institute members have access to the full range of resources provided at Penn State at all levels.

Priority 2: Provide a Technical Infrastructure

Throughout the college, the acquisition of data and the creation of predictive models is performed at different scales and across multiple sectors. Yet, the ability to analytically compare these datasets across projects, to put the various scenarios or simulations into conversation with one another, and to make the data graphically accessible and usable for decision making remains a challenge.

In order to achieve the aspirations set out in the science-to-practice framework for the institute, researchers affiliated with SAFES need access to considerable computing capacity, data storage, graphic expertise, and computational design. Additionally, making available the stored datasets created by institute members and accessing other large datasets (usually at a cost) is crucial for institute members to potentially synthesize data across projects and research questions. The **Assistant/Associate Director of Research Programs** connects institute members to university-scale resources for complex computational, data, graphic, and design needs while still maintaining the personalized and distinctive support afforded at the college level.

Computational Resources and Support

Under SAFES, researchers are connected to data resources as well as the expertise of the other researchers who created the relevant datasets. The potential utility of this facilitated cooperation of data will help to further the research trajectories of institute members by conveying what is in the datasets and how they were constructed, the strengths and weaknesses of the datasets, and guidelines for proper scientific (and in some cases, ethical) use of the datasets.

An inherent challenge of building a technical infrastructure is the constant evolution of technology and equipment. Therefore, centralizing these resources at the university level allows for a more efficient method of upgrading and sustaining an infrastructure that is stable while at the same time allows for innovation and expansion. **Institute for CyberScience Advanced CyberInfrastructure (ICS-ACI)** is a high-performance research cloud operating within the Institute for CyberScience and under the Penn State Office of the Vice President of Research. This system currently provides secure, world-class high-performance computing for advanced simulation and statistical modeling, data analysis, data mining, and machine learning.

The organizational umbrella of SAFES is a **connective interface** to the technical support structure needed by institute members **to take the next big step** in expanding their projects **to better understand** some of the planet's most pressing problems and **to investigate potential scenarios and solutions** to address them.

The growth of SAFES will utilize the computational capabilities of ICS-ACI's current capacity for running simultaneous complex simulation or statistical models. As additional SAFES members require these services, it is expected that expanded data storage and sharing solutions will be necessary. Such expansion stands to also benefit related disciplines in the colleges of Earth and Mineral Sciences, Science, and Engineering, and the leadership of ICS-ACI has expressed a willingness to coordinate future augmentations of their current systems to accommodate these needs. Establishing future inter-institutional policies, particularly regarding data sharing within and external to the university, is also imminently important and can be knowledgeably addressed and supported through this close affiliation with ICS-ACI.

The compute and data storage services provided through ICS-ACI are subscription based. Technical consulting is also a key service that is offered and will be invaluable to SAFES members. The **Assistant/Associate Director of Research Programs**—familiar with the technical language and concept for data management, sharing, and computational operations—serves as a fluent liaison between SAFES members and the services of ICS-ACI, coordinating and connecting researchers to available computational resources. Additional possible affiliations and partnerships include the **Center for Human-Computer Interaction** and the **Center for Big Data and Discovery Informatics**. These centers, both under the College of Information Sciences and Technology, would link SAFES members to a community of experts in graphic user interfaces and decision support systems that involve large amounts of disparate data.

Priority 3: Coordinate Partnerships and Engagement

Understanding the complex socio-ecological problems that require the integration of natural and social sciences to develop solution-oriented outcomes necessitates collaboration with stakeholders wrestling with these problems. In addition to encouraging interdisciplinary activity among the participating faculty members of the institute, the **Assistant/Associate Director of Partnerships and Engagement** works on behalf of institute members to cultivate and engage a wide diversity of partners and stakeholders and develop forums and strategies for engagement to implement science-to-practice solutions.

Shared Discovery

The complex nature of the problems facing the science of agricultural sustainability requires a heterogeneous approach that blurs the distinction between disciplinary boundaries but also expands beyond the walls of the academic institution. By embracing a transdisciplinary perspective of research, institute members build relationships with essential partners within and beyond the university, learning from one another and strengthening the projects from conception to implementation.

SAFES will encompass and expand the research and engagement activities of the Environmental and Natural Resources Institute (ENRI), incorporating the **Agriculture and Environment Center (AEC)** under the arm of Partnerships and Engagement as the model as well as the foundation for future transdisciplinary partnerships. AEC initiatives have employed a “deliberate, focused engagement and communication process,” coined *shared discovery* by the teams. Fundamentally, the approach establishes a transdisciplinary network through which investigators gain input from stakeholders and other external collaborators in an iterative co-production of knowledge. This strategy of “infusing research with stakeholder engagement and input” also equips the investigators with innovative

SAFES promotes a **transdisciplinary approach** by actively and regularly engaging essential partners within and beyond the university in a productive feedback loop of co-learning and dissemination.

methods for the implementation of research results that can be specifically tailored and therefore more readily applicable to stakeholder needs.

The **Assistant/Associate Director of Partnerships and Engagement** broadens the engagement network for SAFES by coordinating an **Advisory Board** of representatives from industry,

governmental agencies, NGOs, and other stakeholders. Key institute members are also critical members of this board, representing current projects supported by the institute and fostering the alignment of research agendas across these partnerships.

Linkages and Partnerships

SAFES is formally affiliated with the **Penn State Institutes of Energy and the Environment (IEE)**, and will continue to foster the on-going partnerships with researchers among IEE’s sister institutes, such as the **Earth and Environmental Systems Institute (EESI)** in the College of Earth and Mineral Sciences and the **Rock Ethics Institute** in the College of Liberal Arts. SAFES also benefits from shared expertise of faculty associated with other university-level institutes, such as the **Huck Institutes of Life Sciences**, the **Social Science Research Institute**, and the **Sustainability Institute** described in more detail in the Executive Summary.

The institute will help to sustain and propel the decades-long collaboration between the **USDA Agriculture Research Service (ARS)** and the College. Since the **ARS Pasture Systems & Watershed Management Research Unit** was established at University Park in the early twentieth century, federal researchers have worked closely with college faculty on studying the interactivity of plants, soil, and animals in the pastures and watersheds of the northeast. As a part of the Upper Chesapeake Bay **Long-Term Agroecosystem Research Network (LTAR)**, researchers in the college expand their partnership with ARS in conducting research that will advance sustainable intensification of agriculture while at the

same time improve and enhance the agroecosystems specific to the northeast. This partnership is premised in the land-grant mission, so that sharing the research findings with regional producers and other stakeholders is central to this on-going project.

Across the college, well-funded projects demonstrate a groundswell of productivity that forms a strong scaffold on which future research may be pursued and collaborative teams formed. New and ongoing research projects demonstrate the conceptual science-to-practice model wholly or

in part, indicating how intrinsic this framework already is within the college but also how vital the partnerships beyond the university are to the success of the projects.

SAFES is a **coordinating hub** for institute members to **build critical partnerships** with external entities as well as **efficiently connect to related research communities** across the university.

- The **Program on Coupled Human and Earth Systems (PCHES)** is building a connected community of practice across disciplines centered on creating new integrated modeling frameworks that couple energy, water, and land systems.
- The **Center for Insect Biodiversity** creates a transdisciplinary ecosystem to drive convergence research on understanding how insects respond to stresses in order to predict their responses and to make informed recommendations on how to intervene.
- **LandscapeU** provides a new model of university-society partnerships focusing on training the next generation of transdisciplinary scholar-practitioners in comfortably crossing disciplinary boundaries and partnering with stakeholders in co-producing solutions.
- The **Center for Nutrient Solutions** collaborated with the USDA ARS to share data on three LTAR Watershed Sites in the Susquehanna-Chesapeake Watershed as a base on which to build new area-specific scenario models informed by the shared discovery process.
- The **Sustainable Dairy Cropping Systems Research Project**, funded by the Northeast Sustainable Agriculture Research & Education (SARE) in multiple phases since 2010, brings together scientists from eight disciplines from the college and the USDA ARS who work with an advisory panel of farmers, long-term farming system researchers, and the USDA National Resources Conservation Service to integrate best management practices with innovative practices and technologies.
- Recently funded through the USDA NIFA Sustainable Agricultural Systems Program, **Thriving Agricultural Systems in Urbanized Landscapes** also adopts the shared discovery approach to engage stakeholders in envisioning how agriculture in urbanized areas needs to evolve to realize desired futures.

- Another recent USDA NIFA-funded project to build a **Network for mitigation of enteric methane, ammonia, and nitrous oxide emissions from ruminant livestock** will collate and continue to collect data from network collaborators to produce emissions prediction models that can provide to stakeholders scientifically-based recommendations for greenhouse gas and ammonia mitigation practices through dietary, feed additive, or other mitigation options.

These projects and partnerships, connected to one another under the institutional framework of SAFES, stand to benefit from the organizational support afforded by the institute. The **Assistant/Associate Director of Partnerships and Engagement** together with the **Assistant/Associate Director of Research Programs** maintains open channels of communication that link these spokes of activity into a productive and cooperative network of data and resources.

Delivery Mechanisms for Outreach

The shared discovery outreach process is fundamentally also an educational endeavor that contributes to understandings from multiple perspectives. Out of the iterative process that combines expertise from the field, the lab, industry, and the government come the research findings and the potential solutions, and the delivery mechanisms for this information require inventive strategies for encouraging

SAFES supports **inventive delivery mechanisms** by partnering with Penn State Extension to disseminate the **collaboratively derived research findings** and encourage **adoption and implementation**.

adoption and implementation. An important partner in this effort is **Penn State Extension** and the cadre of Extension Educators devoted to issues of agricultural sustainability. Leveraging the community-centric relationships helps to strengthen the collaborations of faculty researchers by infusing the science-to-practice model with crucial,

on-the-ground input from conception through development and application. The institute will sponsor coordinated programming with Extension, as well as other forms of information dissemination, with the **Assistant/Associate Directors of Educational Programs and Partnerships & Engagement** working closely with the **Marketing and Communications Specialist** to develop materials and with the Administrative Support staff in planning events.

Cultivating and Sustaining Partnerships

The relationships formed through past projects led by the AEC provide a solid foundation for sustaining continued partnerships as well as demonstrating opportunity and agility in cultivating new ones. The **Assistant/Associate Director of Partnerships and Engagement** will build on these successes and continue to develop opportunities for engaging and informing policy makers as well as providing opportunities for the research outcomes of the institute to inform a collaborative dialogue that can advance policy.

- The groundbreaking **2008 Ag in Balance Conference** set the tone for collaborative efforts in Pennsylvania agriculture and the environment and positioned the College of Agricultural Sciences as a leader in solving complex problems and informing policy.

- The **Pennsylvania in the Balance Conference in 2016** more specifically focused on agriculture and water quality, helping to shape innovative, industry-led solutions to address Chesapeake Bay water quality goals for agriculture.
- The **PA in the Balance 2019 Conference** provided a forum for thought leaders to inform and strengthen the Phase 3 Watershed Implementation Plan for the Chesapeake Bay.
- The **Conewago Creek Conservation Collaborative Initiative** developed an innovative community engagement model that facilitated diverse and collaborative watershed partnerships, providing place-based laboratories for conducting research, developing decision support tools, providing Extension education and programming, and implementing science-based solutions to improve the health of land, water, and communities.
- The **Chesapeake Bay Landscape Professional Certification Program** partnered with Penn State Extension to deliver high-impact education and professional training for landscape professionals.
- The AEC also partnered with Extension to provide **Read the Farm** conservation training for agricultural conservation technicians learning to write manure management, agricultural erosion, and sedimentation control plans.

The science-to-practice research methodology advanced by SAFES will enhance these educational and training efforts, providing high-priority, high-impact education and professional training programs.

Priority 4: Expand and Integrate Educational Programs

SAFES provides a unique, multidisciplinary platform and living laboratory to educate students and inspire the next generation of leaders in the science of agricultural sustainability. The educational agenda of SAFES centers on inventive strategies for engaging students, faculty, and institute partners in the iterative processes of a successful science-to-practice framework. The **Assistant/Associate Director of Educational Programs** oversees these activities and integrates them into a coordinated effort across the college's departments and inter-college programs.

Resident Education and Training

SAFES is the administrative home to the **Environmental Resource Management (ERM)** undergraduate program, which integrates field- and lab-based learning across stakeholder groups. ERM gathers faculty from across the college to provide an interdisciplinary, environmental science curriculum with the goal to advance problem-solving, decision-making, and communication skills to solve environmental issues. ERM is a leader in environmental science programs, ranking among the top five in the nation by *Successful Student*. The program offers three tracks for students to tailor their education focused on environmental science, soil science, or water science. The program also connects students to study abroad opportunities and meaningful internships in state and federal agencies as well as non-profit organizations. These activities prepare students to enter fields in

environmental protection, conservation, sustainability, and management of natural resources. Many of the ERM students also continue their education in graduate programs across the nation.

ERM has established partnerships across the university and the State College community, including with the Arboretum, Student Engagement Network, Frost Entomological Museum, Sustainability Institute, MorningStar Solar Home, Penn State compost facility, Student Farm, and Millbrook Marsh Nature Center.

SAFES integrates educational efforts within the science-to-practice framework by **structuring transdisciplinary opportunities** to build experience in the science of agricultural sustainability, digital literacy, transdisciplinary thinking, facilitation and leadership, and landscape analysis.

The research activities that characterize the science-to-practice model of data acquisition/analysis to modeling to decision support systems provide a plethora of opportunities for students at all levels to acquire a range of technical skills that can augment

their educations with practical experience and capabilities and help advance their career prospects. Likewise, the innovative methods of engagement and iterative feedback that underpin this conceptual model give students real-world case studies with applicable experience and transferrable skills in building networks of partners across disciplinary boundaries and beyond the walls of the laboratory or even institution.

Graduate Education

The educational programs of SAFES bolsters efforts beyond the administrative responsibilities of the institute by extending cooperative energy toward the activities and aims of both College of Agricultural Sciences graduate degree programs as well as related inter-college graduate degree programs (IGDP). This includes the **Ecology program** supported by the Huck Institutes of the Life Science, the **Energy, Environmental, and Food Economics program** with faculty from the Colleges of Agricultural Sciences, Earth and Mineral Sciences, and Smeal College of Business, and the potentially new inter-college graduate degree program focused on water research. SAFES creates the opportunity for College of Agricultural Sciences graduate students to work across disciplines and on transdisciplinary teams, affording students an environment in which walls between disciplines are lowered. The team science and innovative outreach strategies that are supported by the institute are exemplary models as much as they are unique learning experiences for graduate students and postdocs working on the collaborative research projects within and affiliated with the institute. Experimental learning and leadership opportunities through these experiences help to prepare students and early professionals in fostering productive stakeholder engagement throughout their careers.

The **Assistant/Associate Director of Educational Programs** leads these efforts, overseeing the ERM program and working with the **Academic Advising Coordinator** to sustain and enhance the curriculum, organize more than twenty-five faculty across five units teaching ERM-designated courses, plan course schedules, and shepherd students through the major and minor. The Assistant/Associate Director of Education Programs also oversees the **Education Executive Committee**, composed of college unit leaders and faculty institute members appointed by the **Institute Director**. This committee facilitates communication with and coordination between academic units.

Priority 5: Support a Unified Communication Strategy

A critical function of the institute is to establish a consistent message that conveys the purpose or vision of SAFES as an instrument to channel complex, landscape-level scientific research into policy innovations. With an emphasis on solution-oriented impacts, this message sets the stage for building a national reputation for the community of researchers by promoting the benefits of adopting smart, sustainable solutions. Communication is integral to every stage and aspect of the institute's work and is therefore the responsibility of all institute leadership, staff, and members to facilitate the circulation of the research impact. SAFES employs a two-pronged approach to communication, reaching a range of audiences both internal and external to the university who are integral to the growth and success of the institute and its mission.

Building a Public-Facing Identity

A robust communication strategy, supported and facilitated by all involved in the institute, is essential to pursuing the vision of SAFES. A simple, clear message that conveys the fundamental contributions and need for the institute must be readily deliverable and comprehensible. The clarity of this message also serves the purpose of uniting the institute members by providing a collective representation to colleagues across the university community as well as establishing a public-facing identity for stakeholders, external media, and peer institutions. The wicked challenges addressed by the science of agricultural sustainability are pressing issues that require integrated team science to first understand and then to discover possible solutions. The urgency of these problems demonstrates the inherent value of the research, but in order to communicate the significance and impact, expertise and professional skills in effective visual and verbal storytelling are necessary in building the national reputation of SAFES.

The **Marketing and Communications Specialist** works with **institute leadership** to regularly produce and document solution-oriented stories and attractive visual media that promote the national identity of SAFES. The Marketing and Communications Specialist consults with sociological experts among the institute members to develop strategies that are effective for communicating with different audiences. This position also coordinates with the **Assistant/Associate Director of Research Programs** and the **technical infrastructure institute members** to develop video representations, such as scenario outcomes. Coaching institute members in consistent presentation of this message is crucial as well and is integral to the responsibilities of the team above. The Marketing and Communications Specialist, in consultation with the institute leadership and cluster leaders, also oversees the web content and social media presence for the institute, working with the **Administrative Support Assistant** to keep the presentation of the institute fresh and to ensure a unified strategy for updating the content. The Marketing and Communications Specialist regularly engages and coordinates with the **College of Agricultural Sciences Communications Team** to produce stories for distribution to news outlets as well as to funding agencies.

SAFES promotes a **national reputation** for institute members by **shaping and documenting a consistent message** to convey the **value and impact** of the research for society at large.

Supporting the Strategic Priorities

Fundamentally, the community of researchers is the core of SAFES; therefore, establishing reliable and regular modes for distributing funding opportunities, creating efficient and productive outlets for discovery and sharing among colleagues, and communicating updates about the accomplishments and advancements within the community of researchers all contribute to strengthening the

Communicating the **value of the research supported by SAFES—translated as potential for new opportunities, successes achieved, and promise for expanding our common knowledge**—is of paramount importance to every other strategic priority for the institute.

conceptual links that collectively define the institute. These communication strategies also serve as a platform for the community to build a common library of data and graphics, as well as methods for their production, that help to make expanded iterations of complex landscape-level research possible. The production of large datasets and methods and means to work with them

are a major output of the institute and serve as an essential tool for communicating the mission of SAFES. These varied modes of communication also incorporate shared discussions that emerge from stakeholder engagement. Members across the institute not only benefit from these interactions, but the communication may also help in strengthening these external relationships by incorporating more voices within the conversation. Across these priorities, students stand to benefit in similar ways as an integral part of the community, building skills incrementally in various capacities so that they learn to adapt and participate in different roles of a project.

The **Marketing and Communications Specialist** works with the **Program Assistant** to plan and disseminate regular and timely newsletters and announcements. Particular attention is paid to collating project updates and producing literature on accessing university resources (both processes overseen by the **Assistant/Associate Director of Research Programs**), collecting and distributing meeting minutes from the External Advisory Board and other partnership interactions (handled by the **Assistant/Associate Director of Partnerships and Engagement**), and gathering —and reporting on student opportunities (coordinated by the **Assistant/Associate Director of Educational Programs**).

Organization

Membership

Associate Members of the institute have faculty appointments in the College of Agricultural Sciences, may serve in the capacity of operating committee members, benefit from the technical infrastructure, and are permitted to request the use of resources and services provided by institute staff.

Affiliate Members of the institute are collaborators on institute-sponsored research projects and may benefit from the institute's resources, services, and infrastructure through affiliation with an Associate Member.

Governance

SAFES is organized under the leadership of the **Institute Director** who oversees three **Assistant/Associate Directors**: Research Programs, Partnerships and Engagement, and Educational Programs. Each of these Assistant/Associate Directors oversee staff members and serve as leads for the related operating committees.

The **Research Clusters** are led by an appointed Associate Member of the institute, each of whom is responsible for working with institute staff to coordinate and plan cluster activities.

The **Environmental Resource Management** undergraduate program is led by the Assistant/Associate Director of Educational Programs with the assistance of the Academic Advising Coordinator.

The **Agricultural and Environment Center** is a primary outreach mechanism of the institute and is led by the Assistant/Associate Director of Partnerships and Engagement.

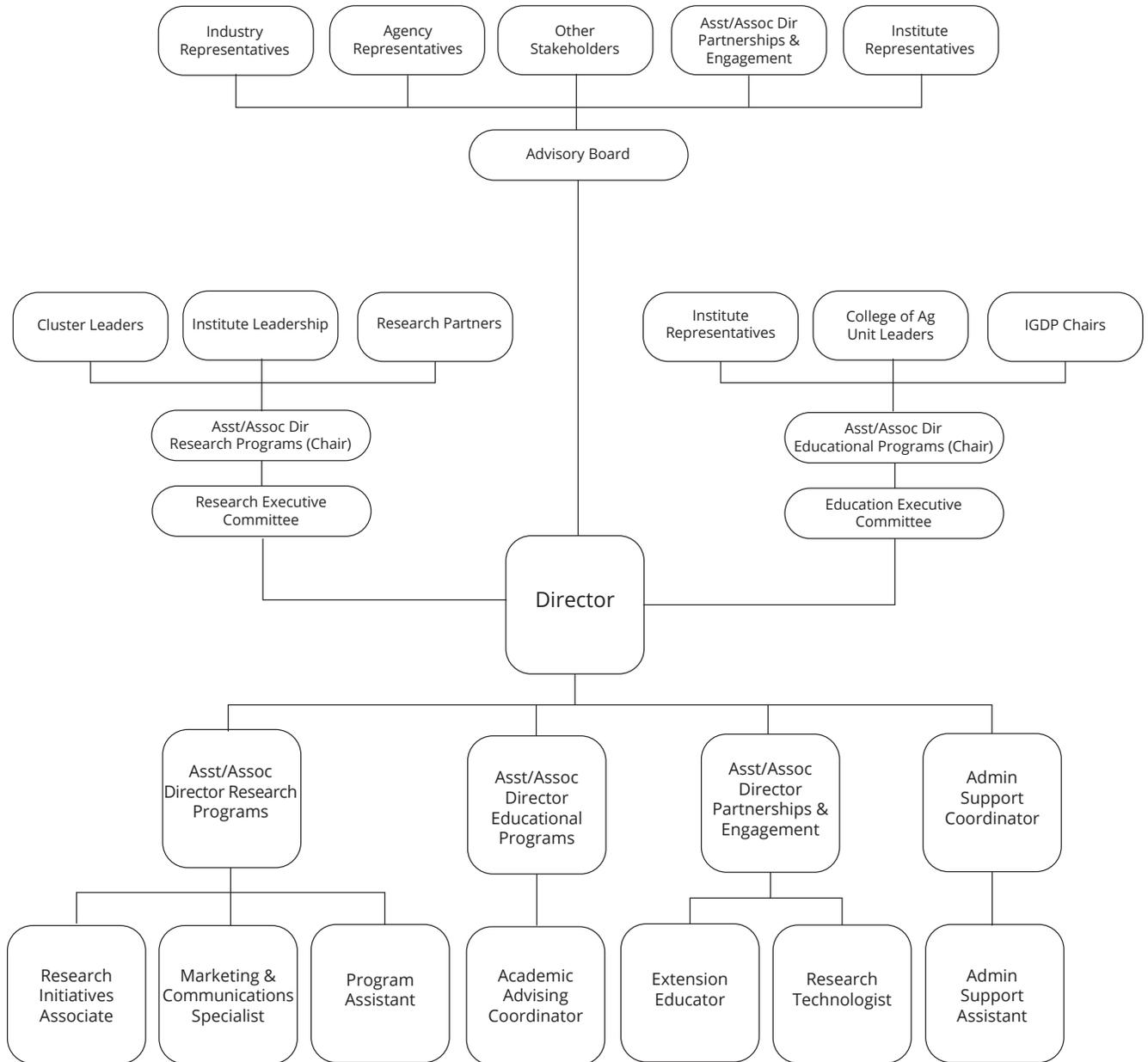
Operating Committees

The **Research Programs Executive Committee** is led by the Institute Director and the Assistant/Associate Director of Research Programs. The responsibilities of this committee include oversight of the research clusters, drafting and instating bylaws and policies for the institute, and guiding the communications strategy. The committee is comprised of the cluster leaders, the Assistant/Associate Directors of Partnerships and Engagement and Educational Programs, and research partners from USDA ARS, Extension, IEE, and other affiliated institutes or related centers at Penn State.

The **External Advisory Board** will be an independent body of stakeholders that include the Institute Director, the Assistant/Associate Director of Research Programs, representatives from SAFES, industry partners, governmental agencies, non-government organizations, and other identified stakeholders.

The **Education Executive Committee** is led by the Institute Director and the Assistant/Associate Director of Educational Programs. This committee includes unit leaders from college departments and inter-college graduate degree programs.

Proposed Organizational Chart



For more information about this initiative
you may contact

The Office for Research and Graduate Education

College of Agricultural Sciences
The Pennsylvania State University

agresearch@psu.edu

This publication is available in alternative media on request.

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Produced by the Office for Research and Graduate Education, College of Agricultural Sciences



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