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# The Sustainable Human and Environmental Systems (SHES) Approach to Sustainability Education and Practice: From the Classroom to the Workplace

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**Abstract:** The Sustainable Human and Environmental Systems (SHES) approach to sustainability education and practice seeks to provide students in higher education with the knowledge and skills needed to meet the existential sustainability challenges that plague the modern world. Colleges and universities that use this approach to prepare students for sustainability-focused careers will find that it has both pedagogical and administrative implications. One way of looking at these implications is as features of the supply side of a marketplace for SHES professionals. On the demand side of this marketplace are two groups of actors. The first is the public and private sector organizations that hire college and university graduates in relevant fields. The second is the professional associations on which those organizations rely to validate the competence of those hires and to guide their workplace activities by means of standards of practice and codes of ethics. Evaluating the current state and future prospects of the demand side of the marketplace for SHES professionals requires answering at least two questions: 1) to what extent are the competencies that the SHES approach regards as essential just as essential to the work of sustainability professionals; and 2) to what extent have the professions themselves recognized these competencies as essential in their standards of practice and codes of ethics? The competencies that the SHES approach regards as essential are of ten general types: holistic thinking; systems thinking; supradisciplinary thinking; complexity thinking; future thinking; adaptive thinking; diversity thinking; collaboration; stakeholder engagement; and project planning, implementation, and outcomes evaluation. Academics and practitioners alike increasingly recognize, at least implicitly, that most if not all of these competencies are essential to the work of sustainability professionals. Unfortunately, the standards of practice and codes of ethics for professionals who work in the sustainability field embrace the SHES essential competencies unevenly or incompletely and usually do so implicitly if at all. One way of looking at this gap is as a distortion of the demand side of the marketplace for sustainability professionals. Rectifying this distortion is among the most important challenges facing the sustainability professions and the societies that they serve.

**Keywords:** Competencies, professional codes of ethics, professional standards of practice, sustainability education.

## Introduction

The Sustainable Human and Environmental Systems (SHES) approach to sustainability education and practice, which is the work of the SHES Roundtable (see, e.g., Focht, Reiter, Barresi & Smardon, 2019 [1]), seeks to provide students in higher education with the knowledge and skills needed to meet the existential sustainability

challenges that plague the modern world.[1] Colleges and universities that use this approach to prepare students for sustainability-focused careers will find that it has both pedagogical and administrative implications.[2] One way of looking at these implications is as features of the supply side of a marketplace for SHES professionals. On the demand side of this marketplace are two groups of actors. In the first group are the public and private sector organizations that hire college and university graduates in relevant fields. In the second group are the professional associations on which those organizations rely to validate the competence of those hires and to guide their workplace activities by means of standards of practice and codes of ethics. The competencies that the SHES approach regards as essential are of ten general types: holistic thinking; systems thinking; supradisciplinary thinking; complexity thinking; future thinking; adaptive thinking; diversity thinking; collaboration; stakeholder engagement; and project planning, implementation, and outcomes evaluation.[3] Evaluating the current state and future prospects of the demand side of the marketplace for SHES professionals requires answering at least two questions: 1) to what extent are the competencies that the SHES approach regards as essential just as essential to the work of sustainability professionals; and 2) to what extent have the professions themselves recognized these competencies as essential in their standards of practice and codes of ethics? This article explores both these questions.

## The SHES Competencies as Essential to the Work of Sustainability Professionals

Academics and practitioners alike increasingly recognize, at least implicitly, that most if not all of the competencies that the SHES approach regards as essential are just as essential to the work of sustainability professionals. The evidence for this trend varies among the competencies.

### *Holistic, Systems, and Supradisciplinary Thinking*

The holistic thinking, systems thinking, and supradisciplinary thinking essential competencies of the SHES approach to sustainability education and practice are intertwined. Students who have acquired the SHES holistic thinking competency at the highest level of proficiency can identify how the complex relationships and interactions of the parts of a whole constitute the whole. Students who have acquired the SHES systems thinking competency at the highest level of proficiency can resolve a system conceptually into a network of interacting subsystems and can synthesize conceptually from a network of interacting systems a more inclusive supersystem. Students who have acquired the SHES supradisciplinary thinking competency at the highest level of proficiency can describe and can explain complex phenomena using neither discipline-dependent theories nor discipline-dependent methods. Because systems thinking is inherently holistic, it transcends the reductionist perspectives inherent in discipline-dependent thinking. In that sense, both holistic thinking in general and systems thinking in particular are supradisciplinary.

Corporate managers whose responsibilities include developing and implementing strategies for achieving the company's sustainability goals increasingly need systems thinking skills, as indicated by an international survey (see Wesselink, Blok, van Leur, Lans & Dentoni, 2015 [2]). The same is true of professionals who engage in environmental site assessment and other appraisal tasks (see, Gazzola, 2011 [3]). The Certificate in Advanced Studies of Sustainable Enterprises (CASSE) at Syracuse University and the SUNY College of Environmental Science and Forestry is an example of a program that educates future sustainability practitioners in both holistic thinking in general and systems thinking in particular (see Smardon, Reiter & Humphreys, 2019, pp. 160–62 [4]). This certificate program was developed to educate business administration, engineering, and environmental science students in systems theory. In the CASSE program, students work in teams, each of which includes students of all three types. While working together to resolve an organizational or environmental problem, students learn how to resolve specific environmental and human systems conceptually into networks of interacting subsystems as well as how to synthesize networks of subsystems into more inclusive supersystems. Sometimes the context requires the students to use discipline-dependent

[1] For the latest features of the approach, see the four other SHES articles in this issue of the *OIDA International Journal of Sustainable Development*.

[2] For more on these implications, see the SHES articles on *The Pedagogical Challenge* and *The Administrative Challenge* in this issue of the *OIDA International Journal of Sustainable Development.*

[3] For more on these competencies and their roles in the SHES approach, see the SHES articles on *The Pedagogical Challenge*, Figures 1 and 2 and the accompanying text, and *Program Evaluation, Transformation, and Recognition*, Figures 2 and 3 and the accompanying text, in this issue of the *OIDA International Journal of Sustainable Development*. This article draws its descriptions of these competencies at the highest level of proficiency from those sources.

methods when doing so. Otherwise, students are encouraged to engage in supradisciplinary systems thinking. The job placement of post-graduation CASSE has been very good to date.

Engineers engaged in environmental work have increasingly stressed the need to bring together a diverse array of disciplinary perspectives and participants drawn from academia, industry, government, NGOs, and communities to implement sustainability science and to develop metrics for assessing the results (see Costa & Scoble, 2016 [5]; Mihelcic et al., 2003 [6]). Similarly, Naderpajouh, Yu, Aldrich, Linkov & Matinheikki [7] emphasized the need for systems engineering training programs to recognize in an interdisciplinary fashion the inter-organizational systems context in which resilience management occurs. These calls highlight the value of, for example, bringing together social science and physical engineering perspectives in a systems thinking context to develop strategies for using green infrastructure to increase the resilience of coastal communities that are highly susceptible to storm and tidal damage. Although interdisciplinarity is not supradisciplinarity, the increasingly widespread recognition of the value of interdisciplinarity in the practice of engineering for sustainability implies how much more valuable supradisciplinarity would be, especially as the scope and complexity of sustainability issues increase.

Natural scientists increasingly have called for the use of systems-based and otherwise holistic approaches in community-based conservation as well as for crossing disciplinary boundaries (see Berkes, 2003 [8]; Perz et al., 2010 [9]). Their call has been inspired by the realization that human and environmental systems must be treated in an integrated fashion if resource conservation and biodiversity protection efforts are to succeed. Resource managers advocate using the same approaches as part of conservation planning to address the research-action gap between the researcher/practitioner and the affected community regarding power, respect, and recognition of the impact of decisions on local populations (see, e.g., Toomey 2016 [10]). Landscape architecture educators have called for environmental systems thinking to be placed at the center of both education and practice in their field by broadening the landscape architecture curriculum (see Bishop & Corkery, 2022 [11]; Weller & Hands, 2023 [12]).

***Complexity Thinking***

Students who have acquired the SHES complexity thinking competency at the highest level of proficiency can distinguish both qualitatively and quantitatively between more and less complex situations that are inconsistent with a sustainable society and between more and less sustainable alternatives to those situations. The pitfalls that this competency is intended to avoid take different forms for different types of sustainability professionals. For corporate managers whose responsibilities include developing and implementing strategies for achieving a company's sustainability goals, the challenge is not to oversimplify sustainability management issues and alternatives but to use complexity thinking to address those issues (see Wesselink, Blok, van Leur, Lans & Dentoni, 2015 [2]). For environmental engineers, the challenge is not to oversimplify the complexity of environmental sustainability issues, especially by neglecting their human dimensions, or to place undue reliance on quantitative means of generating sustainable alternatives (see Costa & Scoble, 2016 [5]; Mihelcic et al., 2003 [6]). For natural science professionals engaged in conservation work, the challenge is to examine the complexity of ecosystems through a lens that includes insights drawn from the social sciences and humanities concerning the impacts of human populations on those ecosystems (see Berkes, 2003 [8]; Perz et al., 2010 [9]; Irvine et al., 2016 [13]). For environmental designers, the challenge is to avoid relying too much on intuition and highly qualitative approaches when developing design alternatives (see Bishop & Corkery, 2022 [11]; Weller & Hands, 2023 [12]). Other types of sustainability professionals are likely to encounter similar pitfalls in their own work. Sustainability professionals who have acquired the SHES complexity thinking competency, especially at the highest level of proficiency, are likely to find it much easier to avoid these pitfalls.

***Future Thinking***

Students who have acquired the SHES future thinking competency at the highest level of proficiency can envision alternative futures and pathways to those futures using both forecasting and backcasting. This competency is implicated in the SHES approach to sustainability education and practice in three ways. The first is as a means of teaching would-be sustainability professionals how to engage in future thinking. The second is as a means of teaching stakeholders how to engage in future thinking, which occurs as they collaborate with SHES-educated sustainability professionals. The third is as a means of teaching society how to engage in future thinking, which is part of the social learning component of the SHES approach. Some sustainability professionals, such as architects, landscape architects, and environmental planners, already excel at forecasting the likely outcomes of present trends, which is an important part of the SHES future thinking competency. Landscape architecture researchers at the University of British Columbia, for example, have developed graphic and analytic tools for forecasting and visualizing scenarios for future climate change (see Shaw et al., 2009 [14]; Sheppard, 2005 [15]; Sheppard, 2006 [16]). Only if sustainability

professionals and the public understand what present trends are likely to mean for the future if those trends remain unchanged is it likely to be possible to alter them. The rest of the SHES future thinking competency makes it possible to envision what the alternative futures could be.

### *Adaptive Thinking*

Students who have acquired the SHES adaptive thinking competency at the highest level of proficiency can envision an adaptive response to circumstances that have changed over time or differ from expected circumstances enough to require such a response. This competency is essential for sustainability professionals for two reasons. First, the sustainability of human societies is a moving target because those societies and their environments are dynamic, which means that the relevant circumstances change over time. Second, for that reason and other reasons, no matter how proficient in the SHES future thinking competency sustainability professionals might be, they are unlikely to have perfect foresight. Accordingly, sustainability professions must be able to use methods such as adaptive management or similar tools to respond to changing circumstances in real time and to be able to make corrections when their own predictions turn out to be off target.

### *Diversity Thinking*

Students who have acquired the SHES diversity thinking competency at the highest level of proficiency can recognize different stakeholder values, related perspectives on well-being, and the need to resolve conflicts among related claims. Diversity thinking in this sense can be a challenge for many students and practitioners, especially when their own perspectives have been narrowed by discipline-dependent thinking, because it requires considering the perspectives of a more inclusive set of stakeholders, including perspectives from historically marginalized social groups. The emergence of environmental justice as a focus of public concern has made the need for sustainability professionals to be competent in diversity thinking even more urgent. For decades, Professor Lawrence Susskind at MIT has been the leading proponent of negotiation for joint gains—or "win-win" negotiation—as a means of resolving conflicts among stakeholders in environmental contexts (see, e.g., Susskind, 2018 [17]; Susskind, Cunningham & Cruxên, 2018 [18]; Susskind, Field & Smith, 2016 [19]). The secret to negotiating for joint gains is to penetrate beneath the parties' negotiating positions to work with the parties' underlying interests, identifying points at which those interests coincide and other points at which they differ. The differences allow the parties to achieve joint gains by crafting package deals in which the parties trade interests that each party values differently (meaning, essentially, that each party values to a different degree). Although negotiation for joint gains is not intended to be a means of resolving conflicts among stakeholders over fundamental values, it can be useful in illuminating a diversity of perspectives on stakeholder interests and thus can pave the way for reaching agreement by incorporating that diversity in decision-making.

### *Collaboration*

Students who have acquired the SHES collaboration competency at the highest level of proficiency can work inclusively on a team to accomplish a task. David Bella, an engineering professor at Oregon State University, was an early proponent of the need for environmental researchers to work in a collaborative fashion (see Bella & Williamson, 1976–1977 [20]), and engineers engaged in environmental work have increasingly stressed the need to bring together experts schooled in a diverse array of disciplines from academia, industry, government, NGOs, and communities to work collaboratively to carry out sustainability science (see Costa & Scoble, 2016 [5]; Mihelcic et al., 2003 [6]). The CASSE certificate program at Syracuse University arrays business management, engineering, and environmental science students to work together collaboratively on sustainability problem-solving tasks (see Smardon, Reiter & Humphreys, 2019, pp. 160–62 [4]). Many other sustainability-focused degree programs are also now stressing the ability to work in collaborative fashion. The ultimate challenge in sustainability practice is the need for environmental professionals to work with local communities to achieve community-based action research and/or sustainability planning implementation (see Susskind, Cunningham & Cruxên, 2018 [18]). Environmental professionals who acquired the SHES collaboration competency as students will be capable of satisfying that need.

### *Stakeholder Engagement*

Students who have acquired the SHES stakeholder engagement competency at the highest level of proficiency can demonstrate the skills needed to engage stakeholders in ways that would move a society toward a sustainable future. This competency is strongly interrelated with both diversity thinking and collaboration. There is considerable work on developing curricula and educational programs for stakeholder engagement. Again, the work of Professor Lawrence Susskind at MIT comes to mind as he has developed multiple publications and educational materials on stakeholder engagement for both students and practicing professionals over several decades (see, e.g., Susskind, 2018

[17]; Susskind, Field & Smith, 2016 [19]). Developing such stakeholder skills and competencies sounds like a straightforward task, but the ability to do so within the applied arena takes a good deal of skill, patience, and practice.

***Project Planning, Implementation, and Outcomes Evaluation***

Students who have acquired the SHES project planning, implementation, and outcomes evaluation competency can contribute to planning, completing, and evaluating the outcomes of a project. This competency is essential to the work of sustainability planning and design professionals, especially as related to green infrastructure or nature-based design as the project team moves from contributing to project planning, to implementation, and to evaluating the project outcomes. One example is the Jamaica Bay Living Breakwater design and implementation work of the landscape architecture firm SCAPE, which involved oyster aquaculture research and organic material development through a collaborative and inclusive partnership of academic researchers, design professionals, artists, and NGOs (see Orff, 2016 [21]). The success of collaborations of this type also requires at least some of the participants to be competent in systems thinking as a form of holistic thinking, as well as in complexity thinking, diversity thinking, and collaboration in the SHES sense. In the Jamaica Bay example, all of the project actors were involved in project planning, implementation and outcome assessment. Competency in supradisciplinary thinking would be an asset as well because of its links with holistic thinking in general and systems thinking in particular.

These trends demonstrate an implicit recognition on the part of academics and practitioners alike that the competencies that the SHES approach regards as essential are just as essential to the work of sustainability professionals, although the relative importance of these competencies is likely to vary depending on the setting. For example, to succeed in achieving their goals in community settings, sustainability professionals must understand how community practice handles environmental matters and must be able to interact with, to communicate, to understand, to evaluate, and to manage the connections between the everyday needs and practices of those communities, on the one hand, and scientific environmental research, on the other (see Datta, 2017 [22]). One way of ensuring that these prerequisites are met is to couple systems-based approaches with service learning and so to involve environmental professionals, academics, and community groups in co-production approaches to environmental problem-solving, planning, and design decision-making (see Susskind, 2018 [17]; Brundiers, Wiek & Redman, 2010 [23]; Reiter et al., 2013 [24]; Simon et al., 2013 [25]). Doing so requires at least some of the participants to be competent in systems thinking, which is a form of holistic thinking, and in future thinking, diversity thinking, collaboration, and stakeholder engagement in the SHES sense. If participants are competent in supradisciplinary thinking too, then so much the better because the SHES systems thinking, holistic thinking, and supradisciplinary thinking competencies are intertwined. One example of the use of service learning in a relevant context is an interdisciplinary course with carbon accounting and climate action planning in Central New York State, which was a combined environmental systems and service-learning process that involved working directly with agencies and local communities in Central New York (see Ramsden, Smardon & Michel, 2014 [26]).

**The SHES Essential Competencies in Professional Standards of Practice and Codes of Ethics**

In general, the standards of practice and codes of ethics of the professions themselves have not kept pace with the emerging recognition on the part of academics and practitioners alike, at least implicitly, that most if not all of the SHES essential competencies are essential to the work of sustainability professionals. These standards of practice and codes of ethics vary substantially in the extent to which they embrace the SHES essential competencies.

The *Code of Ethical Practice and Values* of the International Society of Sustainability Professionals (ISSP) (International Society of Sustainability Professionals, 2015, p. 23 [27]) stands out in the extent to which it explicitly embraces a SHES essential competency. This code urges ISSP members: "Be innovative: Endeavor to be an innovative *systems thinker* in the pursuit of long-term environmental, social and economic sustainability" (emphasis added). By explicitly embracing the SHES systems thinking competency, the ISSP code implicitly embraces the SHES holistic thinking competency as well.

The *Code of Ethics and Standards of Practice for Environmental Professionals* of the National Association of Environmental Professionals (NAEP) [28], which includes Guidance for Practice as an Environmental Professional, embraces a SHES essential competency a bit less explicitly. Its Creed includes as one of the two objectives of an environmental professional "to promote and develop policies, plans, activities, and *projects* that achieve complementary and mutual support between natural and manmade, and present and future components of the physical, natural and cultural environment" (emphasis added). Its Guidance goes on to describe how "planning," "assess[ment]," and other activities should occur in the context of a "project." These features evoke in relatively explicit terms aspects of the SHES project planning, implementation, and outcomes evaluation competency, if not the

competency in its entirety. *The Code of Practice for Sustainable Development and Environmental Stewardship* of the World Federation of Engineering Organizations (WFEO) [28] embraces aspects of the same competency to a similar degree.

Several standards of practice or codes of ethics at least imply the value of a more complete set of SHES essential competencies. The NAEP's *Code of Ethics and Standards of Practice for Environmental Professionals* [28] is one example. Its Guidance for Practice as an Environmental Professional takes the form of a pledge to act in accordance with eight precepts. Among other things, these precepts require NAEP members to

- "recognize that total environmental management involves the consideration of all environmental factors including: technical, economical, ecological, and sociopolitical, *and their relationships*" (emphasis added) [the SHES systems thinking competency];
- "seek common, adequate, and sound technical grounds for *communication with and respect for the contributions of other professionals* in developing and reviewing policies, plans, activities, and projects" (emphasis added) [the SHES diversity thinking and collaboration competencies]; and
- "*encourage public participation* at the earliest feasible time in an open and productive atmosphere" (emphasis added) [the SHES stakeholder engagement competency].

The NAEP pledge also requires environmental professionals to "utilize and participate in *interdisciplinary teams* wherever practical to determine impacts, define and evaluate all reasonable alternatives to proposed actions" (emphasis added). Although interdisciplinarity is not supradisciplinarity, the pledge's reference to the former nevertheless implies the value of any approach designed to reduce the constraints on the effectiveness of environmental professionals imposed by the boundaries of academic disciplines. The SHES supradisciplinary thinking competency improves upon interdisciplinarity in that regard by transcending disciplinary boundaries entirely. Finally, the NAEP pledge requires environmental professionals to "assess *short-term versus long-term productivity with and without the project or action*" (emphasis added), which implies the value of the SHES future thinking competency. Similarly, the WFEO's *Code of Practice for Sustainable Development and Environmental Stewardship* [29] implicitly embraces the SHES collaboration, diversity thinking, future thinking, systems thinking, and stakeholder engagement competencies as well as the SHES project planning, implementation, and outcomes evaluation competency. The *ASLA Code of Environmental Ethics* of the American Society of Landscape Architects [31] implicitly embraces the SHES systems thinking, holistic thinking, future thinking, stakeholder engagement, and collaboration competencies.

As this survey shows, the standards of practice and codes of ethics for professionals who work in the sustainability field embrace the SHES essential competencies unevenly or incompletely and usually do so implicitly if at all. This pattern ought to concern academics and practitioners alike, given their increasing recognition, at least implicitly, that most if not all of the competencies that the SHES approach regards as essential are just as essential to the work of all types of sustainability professionals. The lack of even implicit references in the standards of practice and codes of ethics to three SHES essential competencies—supradisciplinary thinking, complexity thinking, and adaptive thinking—should be especially concerning. Without having acquired the SHES supradisciplinary competency, sustainability professionals will remain susceptible to the tunnel vision implicit in discipline-dependent thinking. Without having acquired the SHES complexity thinking competency, they will be in a poor position to grapple with the one attribute that—more than any other—is responsible for the intractability of the existential sustainability challenges that plague the modern world, which is their almost mind-boggling complexity. Without having acquired the SHES adaptive thinking competency, sustainability professionals are unlikely to recognize when a planned response to circumstances that are inconsistent with a sustainable society is no longer viable, even if it was at one time. In all three respects, sustainability professionals are likely to be much less effective than they would have been otherwise, regardless of the subject matter context in which they work.

## Conclusion

Among the practitioners who increasingly recognize, at least implicitly, that most if not all of the SHES essential competencies are essential to the work of sustainability professionals are the practitioners who hire college and university graduates to work as sustainability professionals in public and private sector organizations. Unfortunately, the professional associations on which these employers rely to validate the competence of those hires and to guide their workplace activities by means of standards of practice and codes of ethics have not kept pace with this trend. One way of looking at this gap is as a distortion of the demand side of the marketplace for sustainability professionals.

Rectifying this distortion is among the most important challenges facing the sustainability professions and the societies that they serve.

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