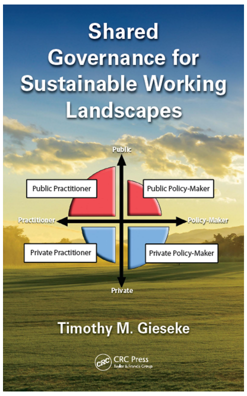

Shared Governance for Sustainable Working Landscapes

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Introduction

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chapter one

Introduction

The world would be a different place without the benefits received from agriculture and food systems (Müller et al., 2015). These agroecosystems, which are a biological and natural resource system managed by humans for the primary purpose of producing food, could also be considered the largest ecological experiment on Earth (Sandhu et al., 2015). For millennia, agriculture has been the most visible example of human interaction with the landscape (Wood et al., 2000).

Some 26% of the earth constitutes ice-free land. Of that, land use consists of urban (1%), villages (6%), croplands (21%), rangelands (30%), forests (19%), and wildlands (23%). These land uses are in transition from wildlands, initial clearing, subsistence, and small-scale farming, to urban settlement and intensive agriculture; all of these stages are going on concurrently somewhere in the world (Defries et al., 2006).

Agroecosystems now cover 5 billion hectares worldwide and include 1.5 billion hectares arable land under annual crops, such as cereals, legumes, and oilseed crops (Wratten et al., 2013). At the turn of the century, the food production from these agroecosystems was valued at around $1.3 trillion per year and provided 94% of the protein and 99% of the calories consumed by humans. This production system directly employs around 1.3 billion people (Wood et al., 2000).

1.1 Agricultural transition phases

Agricultural systems have transitioned through four phases in the last two centuries from primarily a labor-intensive industry that converted natural landscapes to farmland to a high-tech production system influenced by a socioeconomic movement seeking environmental benefits (Timmer, 1988). Each subsequent phase of agriculture production was accompanied by an increase in the number and diversity of stakeholders resulting in a more complex socioeconomic system.

The pioneering phase began during the late nineteenth century in North America, Australia, and New Zealand. This first phase was characterized by critical shortages of labor and capital and involved land clearing and development. A relatively large percentage of the population was involved directly by providing labor through human capital. Stakeholders consisted of farmers, governments, industry, and localized trade.

Second, the production phase occurred in the early portion of the twentieth century. The growth of both domestic and international markets led to the use of technologies and science to improve farming systems. Additional stakeholders became involved as industries provided more production inputs, governments provided support, land grant universities expanded research, and businesses expanded trade.

Third, the productivity phase in the mid- to late-twentieth century focused on improving the productivity of farming systems to address the long-term decline in real commodity prices. Industrialization reduced the need for human labor and the sphere of stakeholders grew because inputs of energy, fertilizers, genetics, chemistries, and processing techniques were researched and developed. The conservation movement emerged with a focus on soil erosion and addressing on-farm conservation needs. This phase contained similar stakeholder types of the second phase but the numbers increased owing to its industrialization in production and conservation. This industrialization of agriculture led to significant positive economic effects, but negative ecological effects were beginning to be realized (Sandhu and Wratten, 2013).

The fourth and the current sustainability phase began in the 1980s and was the result of a growing concern for production efficiency, social responsibility, and the environment. A much broader base of stakeholders included corporations, nongovernment organizations (NGOs), retailers, and consumers as society began to view food and agricultural production in a more holistic manner. New intersector relationships developed and a realignment of organizational goals occurred. In the United States, the United States Department of Agriculture (USDA) refocused and renamed the Soil Conservation Service the Natural Resources Conservation Service (NRCS) to reflect this shift in focus from on-farm production and conservation needs to accounting for off-farm environmental impacts.

1.2 A paradigm shift

This seemingly simple shift in focus from on-farm needs to off-farm impacts continues to have profound implications for agriculture, governments, the environment, society, and the food system. It shifted agriculture conservation from largely the technical problem of solving erosion to an environmental problem with political, social, and economic dimensions. This shift in both scope and scale is comparable to going from "fixing the gully in the back 40," a relatively simple technical issue to solve, to "fixing the Gulf of Mexico hypoxic zone of the lower 48," a highly complex, socioeconomic, and ecological problem. The knowledge, skills, and abilities needed to address this new paradigm transcended the capacity of any single organization and sector, government or otherwise.

In addition to the vastly different scope and scale of the issue, new sustainability stakeholders emerged from corporate, NGOs, utilities, and financial sectors. The landscape is beginning to be viewed as *natural capital*, and recognized as the foundation on which our economies, societies, and prosperity are built (Rapacioli et al., 2014). These elements of nature, such as forests, rivers, land, minerals, and oceans, provide, in addition to the consumable goods, *ecosystem services*, such as carbon sequestration, water purification, biodiversity, and habitat and soil health. These services are now recognized as vital processes that are directly impacted by human activities.

In total, this seemingly simple shift in focus from on-farm needs to off-farm impacts exponentially increased the complexity of agricultural landscape sustainability by adding new values, stakeholders, organizations, and objectives. The problem was no longer a one-time technical issue to be addressed by conservation engineers, but instead became an ongoing socioeconomic problem within the context of local and global environmental issues. It became a *wicked* problem.

1.3 A wicked problem

Rittel and Webber (1973) introduced the term *wicked problems* to describe problems of an open societal system consisting of many variables and stakeholders. They are unlike ordinary or *tame* problems that can be solved with the traditional professions in science and engineering. Tame problems, such as landing a human on the moon, may be complicated, but are solvable and replicable. Wicked problems, such as raising a child, managing an economy, or addressing watershed concerns, are ongoing issues with a continuous one-shot opportunity to influence the outcomes. Rittel and Webber (1973) list 10 properties of wicked problems (Box 1.1) and compared them with ordinary or tame problems.

BOX 1.1 THE 10 PROPERTIES OF WICKED PROBLEMS

1. **There is no definitive formulation of a wicked problem.** It's not possible to write a well-defined statement of the problem, as can be done with an ordinary problem.
2. **Wicked problems have no stopping rule.** You can tell when you've reached a solution with an ordinary problem. With a wicked problem, the search for solutions never stops.
3. **Solutions to wicked problems are not true or false, but good or bad.** Ordinary problems have solutions that can be objectively evaluated as right or wrong. Choosing a solution to a wicked problem is largely a matter of judgment.

(*Continued*)

4. **There is no immediate and no ultimate test of a solution to a wicked problem.** It's possible to determine right away if a solution to an ordinary problem is working. But solutions to wicked problems generate unexpected consequences over time, making it difficult to measure their effectiveness.
5. **Every solution to a wicked problem is a "one-shot" operation; because there is no opportunity to learn by trial and error, every attempt counts significantly.** Solutions to ordinary problems can be easily tried and abandoned. With wicked problems, every implemented solution has consequences that cannot be undone.
6. **Wicked problems do not have an exhaustively describable set of potential solutions, nor is there a well-described set of permissible operations that may be incorporated into the plan.** Ordinary problems come with a limited set of potential solutions, by contrast.
7. **Every wicked problem is essentially unique.** An ordinary problem belongs to a class of similar problems that are all solved in the same way. A wicked problem is substantially without precedent; experience does not help you address it.
8. **Every wicked problem can be considered to be a symptom of another problem.** While an ordinary problem is self-contained, a wicked problem is entwined with other problems. However, those problems don't have one root cause.
9. **The existence of a discrepancy representing a wicked problem can be explained in numerous ways.** A wicked problem involves many stakeholders, who all will have different ideas about what the problem really is and what its causes are.
10. **The planner has no right to be wrong.** Problem solvers dealing with a wicked issue are held liable for the consequences of any actions they take, because those actions may have such a large impact and are hard to justify.

Source: Adapted from Rittel, H. W. J. and Webber, M. M., Dilemmas in a General Theory of Planning, Institute of Urban and Regional Development, University of California, Berkeley, CA, 1973.

Although Rittel and Webber focused primarily on problems related to social policy, their ideas have been applied to a variety of problems that have intersecting economic and ecological dimensions (Hart and Bell, 2013).

Most sustainability issues can be seen as *wicked problems* as they deal with social complexity having decentralized control and intelligence. There is a growing recognition that conventional approaches are inadequate to resolve wicked problems (Hart and Bell, 2013) and the dominant institutions addressing them require a change in their approach (Van Zeijl-Rozema et al., 2008).

Institutional scholars are seeing a need for a paradigm shift in how researchers approach complex societal problems. They have recognized scientific knowledge is necessary but not sufficient to resolve wicked problems (Hart et al., 2015). This paradigm shift toward alternative frameworks to address new societal challenges has helped shape the field of sustainability science (Kates et al., 2001; Hart and Bell, 2013). Sustainability science is a transdisciplinary option that leads to the question of how sustainability science can achieve positive impacts for wicked problems (Vermeulen and Campbell, 2011).

1.4 Sustainability science

Sustainability science has emerged over the last two decades as a vibrant field of research and innovation. Like “agricultural science,” sustainability science is a field defined by the problems it addresses rather than by the disciplines it employs (Clark, 2007; Kates, 2011). The central purpose of sustainability science is not just to analyze problems but to contribute to solving them (Hart and Bell, 2013).

Sustainability science creates new knowledge, coproduced through close collaboration between scholars and practitioners (Clark and Dickson, 2003). This broader understanding is gained from observations, monitoring, and place-based studies. It is intended to aspire practitioners and scientists to move scientific knowledge into action (Kates, 2010).

Kates et al. (2001) proposes a set of core questions (Box 1.2) to guide different sectors to work in concert along sustainability trajectories.

Hart and Bell (2013) recognize sustainability science as science that (1) is problem-driven and focused on deriving and testing solutions based on scientific knowledge, (2) emphasizes the dynamic, coupled interactions between natural and human systems, and (3) stresses active and ongoing engagement with diverse stakeholders.

Sustainability science requires new approaches to make decisions under a wide range of uncertainties in natural and socioeconomic systems. A broader use of networks that alllows scientists and practitioners to engage new expertise and knowledge is critically needed (Kates, 2011). The Proceeding of the National Academy of Sciences (PNAS) recognized this need and created a “room of its own” for the maturing field of sustainability science. This new section in PNAS is intended to transcend the foundational disciplines of geography, ecology, economics, physics, and political science and focus instead on understanding the complex dynamics that arise from the interactions between human and environmental systems (Clark, 2007).

BOX 1.2 CORE QUESTIONS OF SUSTAINABILITY SCIENCE

1. How can the dynamic interactions between nature and society—including lags and inertia—be better incorporated in emerging models and conceptualizations that integrate the earth system, human development, and sustainability?
2. How are long-term trends in environment and development, including consumption and population, reshaping nature–society interactions in ways relevant to sustainability?
3. What determines the vulnerability or resilience of the nature–society system in particular kinds of places and for particular types of ecosystems and human livelihoods?
4. Can scientifically meaningful "limits" or "boundaries" be defined that would provide effective warning of conditions beyond which the nature–society systems incur a significantly increased risk of serious degradation?
5. What systems of incentive structures—including markets, rules, norms, and scientific information—can most effectively improve social capacity to guide interactions between nature and society toward more sustainable trajectories?
6. How can today's operational systems for monitoring and reporting on environmental and social conditions be integrated or extended to provide more useful guidance for efforts to navigate a transition toward sustainability?
7. How can today's relatively independent activities of research planning, monitoring, assessment, and decision support be better integrated into systems for adaptive management and societal learning?

This field seeks to facilitate what the National Research Council has called a "transition toward sustainability," improving society's capacity to meet the needs of a much larger but stabilizing human population and sustain the life-support systems of the planet (Clark, 2007). To meet this sustainability challenge, an equal focus is placed on how social change shapes the environment and how environmental change shapes society (Clark and Dickson, 2003).

Stock and Burton (2011) state sustainability science is not a science by any usual definition. By studying sustainability through multi-, inter-, and transdisciplinary approaches, they noted that scientists are yet to develop a set of principles by which knowledge and sustainability can be systematically built. Rather it consists of the plethora of ideas, sometimes in conflict on how to achieve a sustainable future.

Sustainability science research is attempting to understand how to manage specific places where multiple efforts interact with multiple life-support systems to meet multiple human needs in highly complex and often unexpected ways (Clark, 2007). It is from this highly complex and integrated place-based scenario of agricultural landscape sustainability that wicked problems emerge.

1.5 The wicked features of agriculture sustainability

Rittel and Webber's (1973) 10 properties of wicked problems illustrate a dynamic interaction of multiple parties attempting to achieve multiple and often conflicting objectives on an ongoing basis. The challenges of making the ecological–economic connections, coordinating governance, aligning disparate stakeholders, and accounting for natural capital outputs are cornerstones of a wicked problem.

1.5.1 Ecological–economic disconnections

Agriculture's fourth phase is about reconnecting traditional economic values with that of natural capital and the ecosystem services it provides. Hart and Bell (2013) state this kind of research requires extensive interactions and collaboration between economists and ecologists. In theory, researchers from these two fields should have a lot in common given that the names of the two disciplines share a common root. *Oikos*, derived from the Greek word meaning *house,* is the root word for both "ecology" and "economy." *Ecology*, from Greek *oikos* and *logy* (the study of), is defined as the scientific study of the distribution and abundance of resources and the interaction between organisms and their natural world. *Economy*, from Greek oikos and *nomos*, is defined as the study of how humans use, supply, and distribute the resources that are available to them (Barnhart, 1988). Both systems allocate resources through a complex network of relationships.

Indeed, while it sometimes appears that economists and ecologists occupy entirely different houses that may or may not be located on the same planet, progress has been made in recent years as the two fields worked together on systems for modeling challenges and integration of research themes such as ecosystem services (Hart and Bell, 2013).

1.5.2 Conflicting governance styles

Governance is an awkward term that has different meanings for different individuals and organizations and is applied in various ways (Ho et al., 2014). In its broadest sense, it refers to the various ways through which organizations are coordinated and how "things get done" as it relates to decisions that define expectations, grant power, and verify performance (Meuleman, 2008).

Governance associated with agriculture landscape sustainability is not a straightforward concept and can be seen as a collection of rules, stakeholder involvement, and processes toward achieving many goals (Van Zeijl-Rozema et al., 2008). From an organizational approach, each governance style has its own logic as it relates to relationships, decision making, and compliance (Roe, 2013). Governance comes in several styles consisting of top-down hierarchies, profit-motive market styles, and trust-based networks. Mixing the three governance styles can lead to conflicts, competition, and unsatisfactory outcomes (Jessop, 2002). Meuleman (2013) states there are three problems with the application of these governance styles. First, they can undermine each other. Second, each of them has shortcomings. Third, each has attractiveness to certain personalities, leading stakeholders to perceive their governance style is superior.

Traditional *governing* by governments is undermined by socially complex, wicked problems of sustainability. Unlike typical top-down hierarchical structures, sustainability *governance* is seen as a shared responsibility of representatives from the state, the market, and civil society. Sustainability governance requires an acceptance that there are different perspectives on the concept of sustainability and awareness that multiple modes of governance may be able to steer the process of sustainability. Governance actors may provide leadership from top-down hierarchical styles or bottom-up network approaches (Van Zeijl-Rozema et al., 2008).

1.5.3 Disparate stakeholder values

Wicked problems are social problems created by different stakeholder perspectives and values. The definitions of *agriculture sustainability* are as diverse as the perspectives from individuals, organizations, sectors, and political affiliation. This creates a scenario where there is no agreement on what the problem is and no "right" solutions.

1.5.4 Variable natural capital

Perhaps the most tangible feature of this wicked sustainability issue is the natural capital of the agricultural landscape. Natural capital, like other economic capitals, is the basis for production. It is the soil, topography, plants, animals, and climate associated with the landscape. The less tangible features of natural capital include the bio-geo-chemical processes, functions, and interrelationships of the landscape that enable the agroecosystems to function and produce food and fiber commodities, and ecosystem services. How these components interact with each other and affect local, regional, and global ecosystems is very complex.

1.6 Putting sustainability science to practice

A challenge to putting sustainability science to practice is to determine where to begin. Natural capital, disparate stakeholders, sustainability governance, and the economical–ecological connections seem unwieldy individually, let alone together. Rittel and Webber (1973) state there is no formulation of a problem statement, no immediate test for a solution, no signal when the problem is solved, and each attempt is a "one-shot" proposal that may change the dynamics of the original wicked problem. When addressing complex socioeconomic systems, Ostrom (2007) states that there is no ideal entry point for carrying out rigorous, useful research and the entry point depends on the question of major interest to the researcher, user, or policy maker.

But one must begin. One strategy is based on Hart and Bell's (2013) perspective that the heart of sustainability science is the interactions between nature and society with stakeholder engagement as the cornerstone. They view the practice of sustainability science to be a problem-driven, solution-oriented science with the central purpose of not just to analyze problems, but to contribute to solving them. They also stress the importance of an economist's perspective. In short, we see a mutually beneficial research setting in which economists have "wicked good" training to take on wicked problems and sustainability science has much to offer to economists (Hart and Bell, 2013).

One potential focal point for stakeholder engagement, natural capital valuation, sustainability governance, and making the ecological–economical connection is through an *environmental market signal* (Gieseke, 2011).

1.6.1 An environmental market signal

An environmental market signal is a price or value signal for a particular environmental benefit. A traditional agricultural market signal would be the price offered for a kilogram (or bushel) of grain. An environmental market signal is based on the price or value offered to produce an environmental benefit. These environmental benefits are measured with landscape indices representing the [ecosystem] services provided by the landscape. A water quality index (WQI) represents the quality and/or quantity of water that is shed by a field, farm, or other geographic area with its numerical value-dependent landscape features and management strategies.

One advantage of an index-based market signal is its capacity to communicate with many stakeholders on a variety of sustainability issues. The efficiency of this process approaches economist Hayek's market *marvel* of price. Hayek called the free market system a marvel because just one indicator, price, spontaneously carries so much information that it guides buyers and sellers to make decisions. Like price that reflects thousands, even millions, of decisions made by people who do not know each other (Gwartney, 2010), a landscape index reflects various conditions and activities conducted in time and space that represent a level of sustainability. An index-based environmental market signal has the potential to carry the product or service's environmental information along with the price carrying the economic information.

1.6.2 *Spatially based trading platform*

Unlike the more tangible agriculture commodities such as grain and forages, the value of ecosystem services are often spatially and temporally based; that is, where and when they are produced may be as important as what was produced. While a bushel of wheat provides a consistent value no matter where it is, the value of a WQI is dependent on where the cleaner water is produced and when. A sustainability science approach would combine an environmental market signal with a geographically based platform that accounts for location and timing of the ecosystem service provided.

1.7 *Path to agricultural landscape sustainability*

Eleven case studies were analyzed for various strategies used to achieve their agricultural landscape sustainability objectives. Each was assessed for how agriculture sustainability was defined, accounted for, and valued and how they engaged stakeholders and organizations to produce the environmental benefits. The case studies, as an aggregate, revealed three primary principles of wicked problems and the corresponding components of a wicked solution. This dual finding is expected according to Rittel and Webber (1973), who state that to find the problem is the same thing as finding the solution, and that the problem cannot be defined until the solution has been found. They conclude that the process of formulating the problem and conceiving a solution is identical.

1.7.1 *Assessing wicked problems*

In Chapter 2, *An Enduring Wicked Problem*, three sources of the wicked agriculture sustainability problem are introduced as (1) the varied scope and scale of natural capital outputs, (2) the growing number of disparate agricultural stakeholders, and (3) conflicting governance styles of stakeholder organizations. Chapters 3 through 5 discuss the current status and provide examples for each problem source and how these three factors, individually and in concert, generate inefficiencies, confusion, and conflicts across organizations and sectors.

In brief, a wicked problem emerges as multiple stakeholders' demand and/or value different outcomes from the landscape. For example, grain production, water quality, and soil carbon sequestration may each be demanded from different entities at different scales. Demands for low-cost grain from a local processor, water quality at a national scale, and carbon sequestration at a global scale result in different market signals for different landscape outputs, with them often competing and conflicting. These outputs may be generated by a variety of simple and inexpensive activities or a series of very complex and expensive practices. The potential number of landscape patterns to produce the quantities and qualities of all these outputs in any given year is astronomical. Identifying the ideal landscape patterns that produce abundant food and cleaner water is overwhelming for any single entity (Ruhl et al., 2007).

1.7.2 Devising wicked solutions

In Chapter 6, *Devising a Wicked Solution*, three strategic actions to enable a wicked solution are introduced: (1) create a common landscape language, (2) align stakeholder sustainability activities, and (3) develop a shared governance platform.

The solution begins by organizing a landscape *language* by using vetted agroecological indices developed by government, land grant universities, and institutions. A significant cache of indices exist, but they must be scaled and harmonized to some degree to enable an alignment of stakeholder activities. This alignment is aided with the use of a *governance compass* to provide a new context for the interrelationships of potential stakeholders. The governance compass also describes stakeholders as *governance actors* representing one of four governance sectors: public policy maker, private policy maker, public practitioner, and private practitioner.

These two components (an index-based accounting system and the governance compass recognizing governance actors) enable a shared governance strategy, a concept based on the principles of creating partnerships, equity, accountability, and ownership at the point of services (Porter-O'Grady, 2001). It is at this point of service; the landscape, that activities are often initiated based on the presence or absence of a market signal. Chapters 6 through 9 discuss the accounting methods and governance styles of various case studies. Using these two traits (accounting method and governance style), a *governance footprint* was calculated for each of the 11 case studies. These case studies revealed organization governance styles trending away from top-down hierarchical governance toward more inclusive market and network governance. There was also an accompanied shift from practice-based accounting to outcome-based accounting. These more open governance and inclusive accounting systems enable stakeholders to value ecosystem services by using sustainability portfolios. These portfolios represent sustainability values beginning at the landscape and through corporate supply chains, government programs, and utilities.

1.7.3 *Recognizing the glocal commons*

In Section III, *Designing a Glocal [Business] Ecosystem*, the concept of glocalization is applied to the commons, governance, and the accounting of ecosystem services. *Glocalization* is a neologism meaning the combination of intense local and extensive global interaction (Wellman, 2002). *Glocalization* occurs when local actors have a more pronounced role in addressing global challenges. It denotes a merging of global opportunities and local interests to create a more socioeconomically balanced world (Roldan, 2011) and results in a combination of globalization and localization processes (Vries, 2010) and the *simultaneity* of globalizing and localizing processes (Blatter, 2007). This simultaneity of agriculture's impact results from it being a direct employer of 1.3 billion people with a footprint covering nearly 30% of the earth's land surface. The nature of agriculture, as an industry, affects local, regional, and global economies and ecosystems, simultaneously. The glocal phenomenon needs to be represented in sustainability governance, accounting systems, and commerce.

1.7.3.1 *Global perspectives*

At the global level, agriculture sustainability strategies and natural capital accounting are being sought by global financial, governmental, and corporate interests. A brief list of many similar efforts includes the following:

- The Natural Capital Declaration (NCD) is a global finance-led initiative to integrate natural capital considerations into financial products and services, and to work toward their inclusion in financial accounting, disclosure, and reporting. It is signed by the CEOs of 40 financial institutions, with supporting (nonfinancial) organizations (NCD, 2014).
- Wealth Accounting and the Valuation of Ecosystem Services (WAVES) is a World Bank–led global partnership that aims to promote sustainable development by ensuring that natural resources are mainstreamed in development planning and national economic accounts. This global partnership brings together a broad coalition of United Nations agencies, governments, international institutes, nongovernmental organizations, and academics to implement natural capital accounting where there are internationally agreed standards, and develop approaches for other ecosystem service accounts (Smith, 2014).

- The Natural Capital Coalition (NCC) is a global, multistakeholder open source platform for supporting the development of methods for natural and social capital valuation in business. The coalition brings together global stakeholders to study and standardize methods for natural capital accounting to enable its valuation and reporting in business (NCC, 2015).

1.7.3.2 Local and regional perspectives

At the local and regional levels, a listing of all efforts seeking a natural capital valuation strategy would number in the thousands. Several case studies discussed to various degrees include local, state, and regional efforts such as the following:

- Seattle Public Works and the Government Accounting Standards Board (GASB) on valuing the natural capital of a drinking water supply watershed
- The Sustainability Consortium led by corporate retailers to account for and improve the sustainability of supply chains
- A Minnesota state-level water quality certainty programs led by state and federal governments to account for agricultural practices to improve watersheds
- The Electric Power Research Institute leading a regional water quality trading program to account for conservation practices traded with waste water treatment facilities

These case studies represent efforts at the local, regional, and national levels and within the sectors of government, corporations, utilities, nonprofit organizations, and agribusiness suppliers. In part, they were chosen to illustrate how disparate organizations and sectors have common sustainability objectives, but varied approaches to account for and value sustainability outcomes. In some instances, the same sustainability objective from the same parcel of land is sought, yet the processes are not integrated. This uncoordinated approach results in low and diffuse values for ecosystem services and creates high and multiple transaction costs. Within this context, it is not surprising that markets are unable to emerge and sustain. New values can be realized by reexamining and harnessing system complexity (Axelrod and Cohen, 1999).

1.8 The grand economic challenge

The demand for ecosystem services from farm and agriculture landscapes has grown dramatically—for more types of services and from multiple sectors. This increase is reflected in new government conservation programs, pollution regulations, sustainability standards in corporate supply chains, agriculture-related programs of nonprofit organizations, and the demand from consumers and the food industry for the eco-labeling of agricultural products (Sampson et al., 2013). The number and types of projects and efforts to account for and value ecosystem services are occurring at all scales.

The challenge is not just how to create demand for ecosystem services, but how to convert the existing demand from *absolute demand* to *effectual demand*. Adam Smith observed these differences in the relatively immature economic system of the eighteenth century. He recognized an *absolute demand* is the total demand for a commodity or product from all those who desire it whether or not they have the financial means to purchase it. An *effectual demand* is created when a sufficient price is applied toward a commodity to entice entrepreneurs to produce it (Smith, 1952). Today, these concepts apply to natural capital and ecosystem services. The absolute demand is steadily increasing, but an insufficient effectual demand exists due to the market development challenges of public goods.

The grand economic challenge is to capture and harness the glocal complexity of agriculture landscape sustainability. This includes a transaction process that supports sharing in the costs and values of agricultural landscape sustainability. It is viewing the transaction process from the lens of an ecological *supply web* rather than just the lens of an economic *supply chain*. It is about creating the capacity for stakeholders to interdependently value sustainability.

The Prince of Wales, speaking at The Prince's Accounting for Sustainability Forum at St. James's Palace in London, December 2013 (The Guardian, 2013) expressed these sentiments in this manner:

> In stark financial terms, all the evidence demonstrates a simple fact: we are failing to run the global bank that we call our planet in a competent manner. We no longer just take a dividend each year; instead, for some time, we have been digging deep into our capital reserves. And, after the near collapse of our entire financial system, we all know that such excessive risk-taking can cause immense havoc. The ultimate bank on which we all depend—the bank of natural capital—is in the red; the debt is getting ever bigger and that is reducing Nature's resilience and considerably impeding her ability to restock. It leaves us dangerously exposed.

While addressing natural capital accounting seemed impossible a decade ago, it is now becoming possible by a shift in social values, access to big data, an interconnected society, cryptocurrencies, and the emergence of multisided business platforms (MSPs). MSPs are unique business structures that are disrupting traditional business models in a big way. Goodwin (2015), senior vice president of strategy and innovation at Havas Media, stated

> Uber, the world's largest taxi company, owns no vehicles. Facebook, the world's most popular media owner, creates no content. Alibaba, the most valuable retailer, has no inventory. And Airbnb, the world's largest accommodation provider, owns no real estate. Something special is happening.

What appears to be happening is people are imagining new ways to solve problems with the use of big data and a networked society. The MSPs are capturing existing *unvalued* values of the economy. In the case of Uber, it is unused cars and with Airbnb it is unused living quarters. Even more interesting is Alibaba's creation of an e-commerce ecosystem. Alibaba is generating wealth, not by selling goods, but by creating the structure, processes, and functions of an e-commerce ecosystem and harnessing its complexity. Alibaba, in many respects, is enabling people and businesses to generate new values through the creation of *e-commerce ecosystem services.*

By venturing down these platform and ecosystem paths, these entities are providing a wicked solution to a wicked problem few knew existed. Few recognized the *problem* of unused cars and unused living quarters. Few recognized there were problems in commerce preventing millions of people from interacting and generating transactions. Perhaps, as Rittel and Webber (1973) predicted, they found the problem by finding the solution. As they provided new ways to engage people, it was recognized that the *old way* of doing things was the *wrong way* relative to value creation.

This book proposes the development of a multisided shared governance (MSSG) platform to support an eco-commerce ecosystem. As a geographical-based platform, it consists of delineating the landscape into assessable units with the capacity to calculate ecosystem services: the natural capital outputs and outcomes of the agricultural landscape. The MSSG platform enables sustainability stakeholders to interact at the interface of the two very complex systems of agriculture and the economy to account for and exchange values. This new eco-commerce system is possible by enabling engagement via shared governance; bringing partnerships, equity, accountability, and ownership at the point of service; at the landscape.

And ultimately, the success of the eco-commerce ecosystem is dependent on a design that recognizes that the economic system is a dependent subsystem of the earth's ecological system.