

Traditions and Trends in the Study of the Commons

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1. Introduction

It is with considerable enthusiasm that we introduce the first issue of the new journal – The International Journal of the Commons. The study of the commons has experienced substantial growth and development over the past decades.¹ Distinguished scholars in many disciplines had long studied how specific resources were managed or mismanaged at particular times and places (Coward 1980; De los Reyes 1980; MacKenzie 1979; Wittfogel 1957), but researchers who studied specific commons before the mid-1980s were, however, less likely than their contemporary colleagues to be well informed about the work of scholars in other disciplines, about other sectors in their own region of interest, or in other regions of the world. Nor were they always aware of and consistent about the central theoretical questions regarding the

¹ For the analysis here presented, we take 1985 as a starting point, since we feel that the study of the commons became a more concerted endeavor since the 1980s. That doesn't by any means imply that we do not acknowledge the extensive historical studies of particular types of commons long before 1985.

underlying cultural, demographic, historical, political, and social processes that impact the structure and performance of various types of commons over time. Academic divisions by discipline, sector, and region did not facilitate the accumulation of theoretical insights and empirical testing essential to the development of a good understanding of core processes and underlying problems. Scholars working on the study of the commons since the mid-1980s have helped forge a substantial transdisciplinary approach to the study of an important type of social-ecological system.

In order to increase communication and learning, two endeavors brought scholars together who had conducted important studies of diverse commons. One series of symposia and workshops, organized by Bonnie McCay and James Acheson in 1983 and 1984, involved scholars with cultural as well as ecological interests to address *The Question of the Commons* (McCay and Acheson 1987a, 1987b). Another key event in the 1980s was the establishment of the National Research Council (NRC) Committee on Common Property and the organization of a conference in Annapolis, Maryland in 1985 involving many scholars from multiple disciplines and the eventual publication of many of these papers in a National Research Council report (National Research Council 1986). Scholars who participated in these events wanted to find ways and means to facilitate further interchange across disciplines, sectors, and regions and urged the creation of an international, multidisciplinary association.

Forming an international association, however, is itself a challenging undertaking and it took several more years of effort to establish the International Association for the Study of Common Property, in 1989. The enthusiasm for this effort has steadily grown. Eleven international conferences of this Association have now been held in various parts of the world (see table 1), as well as a grow-

Table 1: IASC(P) Meetings

Year	Venue	Participants	Papers Archived
1990	Durham, North Carolina, USA	210	43
1991	Winnipeg, Manitoba, Canada	350	82
1992	Washington, D.C., USA	100	77
1993	Los Baños, Laguna Philippines	80	53
1995	Bodø, Norway	350	198
1996	Berkeley, California, USA	500	81
1998	Vancouver, British Columbia, Canada	500	176
2000	Bloomington, Indiana, USA	600	367
2002	Elephant Hills, Victoria Falls, Zimbabwe	300	150
2004	Oaxaca City, Oaxaca, Mexico	700	239
2006	Bali, Indonesia	500	266
2008	Cheltenham, England	forthcoming	forthcoming

ing number of regional conferences. In 2006 the name of the association was changed to the International Association for the Study of the Commons in order to broaden the official focus beyond that of studying property rights systems to include new types of commons related to the world of digital resources (Hess and Meinzen-Dick 2006). Today the IASC Comprehensive Bibliography of the Commons, which is online and updated every year, has over 45,000 records with over 10,000 abstracts. Of those records, 20,600 are peer-reviewed journal articles. Also, the Digital Library of the Commons contains over 1550 full-text articles, conferences papers and dissertations and serves as the digital archive of IASC.²

Prior to the publication of Hardin's article on the tragedy of the commons (1968), titles containing the words 'the commons,' 'common pool resources,' or 'common property'³ were very rare in the academic literature. However, between 1968 and 1985, when the Annapolis conference was held, this number seemed to be on the rise (Dietz et al. 2002, pp. 6-7). With an admittedly more powerful search capacity at our disposal,⁴ we will first explore in this article how the research community with an interest in 'the commons' has increased and diversified since 1985. Then we will explain the rationale underlying the selection criteria we applied when editing this issue. We think it is important to take stock and look ahead, regularly. Also, we think it is essential to explore diverse methodological and theoretical approaches. Regarding the future, we think that scholars must embrace the challenge of finding ways to deal more explicitly with complexity, uncertainty, and institutional dynamics. We will subsequently provide an overview of the featured articles. We will then wrap up with a short concluding section.

2. An ever growing field of academic research

Our web-search included articles in peer reviewed journals (given the availability of excellent search engines for journal literature but not equivalently reliable and

² The Digital Library of the Commons: <http://dlc.dlib.indiana.edu/>. The Comprehensive Bibliography of the Commons: <http://dlc.dlib.indiana.edu/cpr/index.php>

³ The use of this limited set of search words creates a bias, and leaves out parts of important literatures – such as historical research – that might use different terms.

⁴ We used scholar.google.com, and applied the following search parameters:

Exact phrase: 'common pool resource' OR 'common pool resources' OR 'common property' OR 'the commons'

Subject area: Biology; Life sciences; Environmental Science; Business; Administration; Finance; Economics; Engineering; Computer Science; Mathematics; Social Sciences; Arts; Humanities
Published between 1985 -2005 (note: Articles from 2006 are still being uploaded on-line. We found that including this year skewed the results)

Search: anywhere in article

Search only pages written in English, Spanish, German, Portuguese, and French (note: since the search words are all in English, the search is heavily skewed towards English language articles)
The web search took place in March, 2007. We eliminated titles that did not appear relevant from our database.

extensive search engines for other sources such as working papers, conference presentations, and books) where we found evidence of substantial growth and development over time. As shown in Figure 1, the number of articles related to the topic of the commons that have been published in peer reviewed journals has grown dramatically since 1985. In our web-search we identified well over 10,000 relevant titles published between 1985 and 2005.⁵

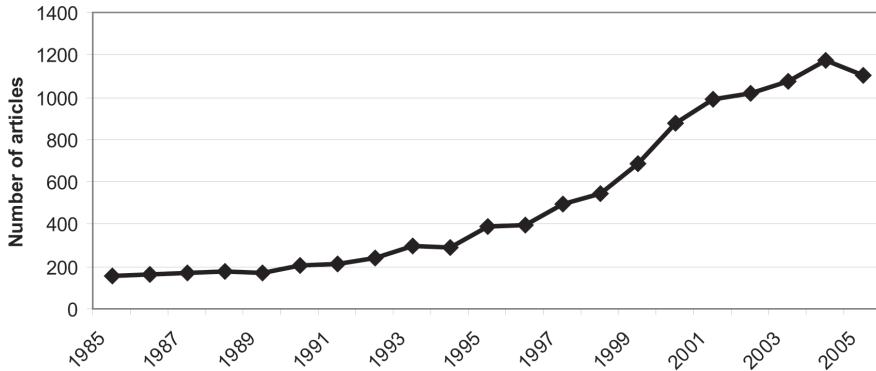


Figure 1: An estimate of the number of articles related to 'the commons,' 'common pool resources,' or 'common property' published in peer-reviewed journals between 1985 and 2005

The growing interest across disciplines is also reflected in the database generated from our web-search. We identified those journals that published 5 or more articles on 'the commons' between 1985 and 2005. In Figure 2, we array these journals according to their general disciplinary orientation. Scholars of the commons are now active in almost all of social sciences. What becomes clear is not only the multidisciplinary reality of our subject matter, but the growing interest of journals specializing in environmental and development studies also seems to reflect that the study of the commons keeps steadily building on its interdisciplinary origins (see Figure 3). In spite of critiques regarding the limited focus of commons scholars (e.g. Johnson, 2004), they are developing an ever better, cumulative understanding of both the collective action issues as well as the deeper historical processes involved in creating effective property regimes (De Moor et al. 2002).

A closer look reveals, not surprisingly, the multiple sectors reflected in our subject matter. In order to make his point, Hardin asked his readers to picture a commons used for grazing. Although used as a metaphor by Hardin, over time

⁵ The trends can be argued to be partially caused by the growing importance of the internet as a channel of communication. When compared to journal articles published on random search words, we observed that the rising trend for articles on 'common property,' 'the commons,' and 'common pool resource(s)' is not likely to be exceptional.

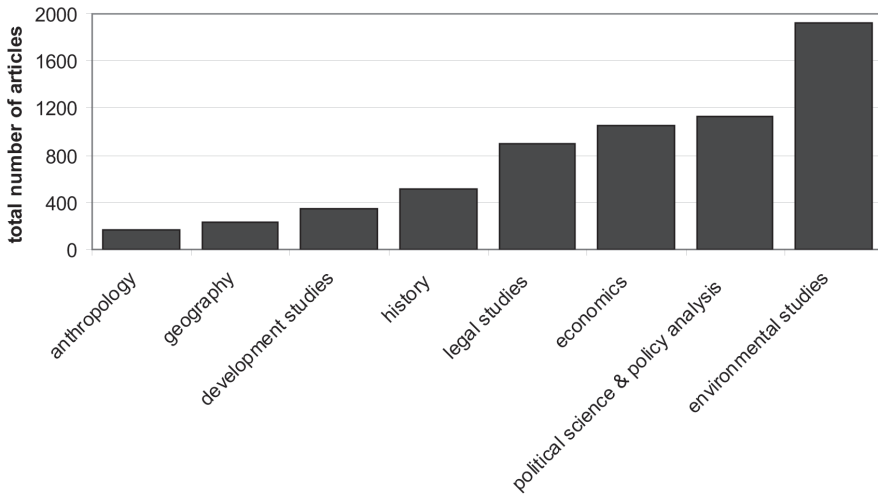


Figure 2: Number of articles per set of disciplinary journals, 1985-2005

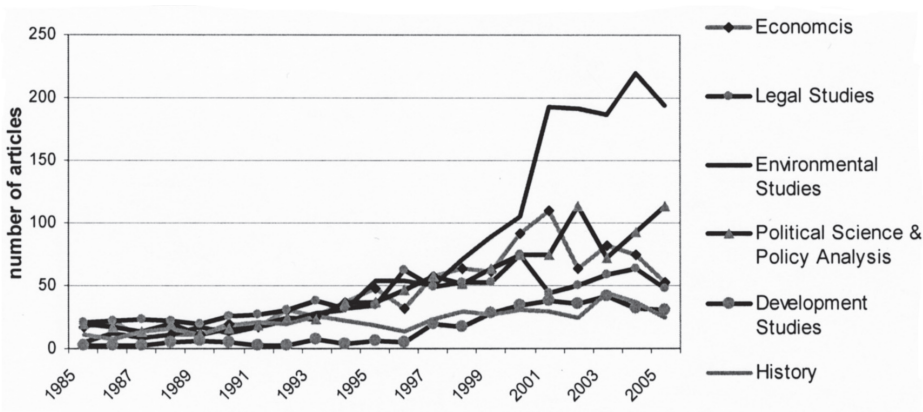


Figure 3: Trends in disciplinary interest in the study of the commons

animal husbandry did indeed become one of the topics of choice of our research community. So did fishery, forestry, irrigation, and water management. How did scholarly interest in approaching these topics from a commons perspective develop over time? In order to answer this question we identified all articles in our database that explicitly mentioned terms related to one of these topics in their titles. Figure 4 shows that titles explicitly referring to forestry and water management seem to be on the rise. Titles referring to irrigation and animal husbandry stay behind the general trend. Fishery as a topic of interest seems to have been following the general trend pretty closely. (Note that this graph reflects relative trends, since the y-axis reflects an index.)

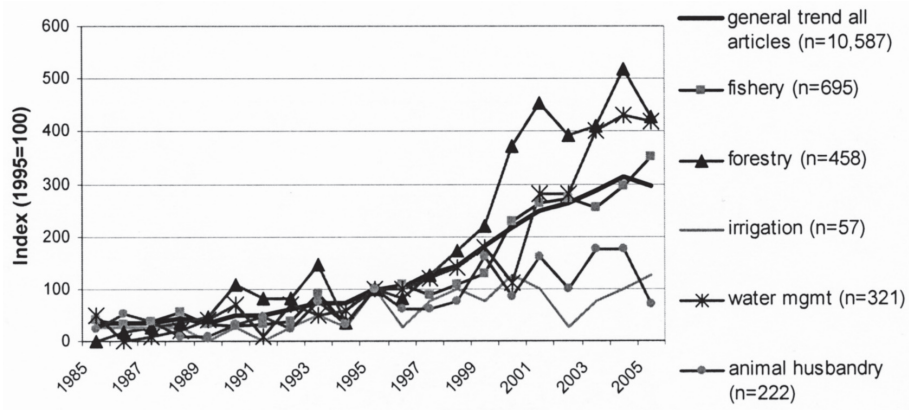


Figure 4: Trends in the 'big five' topics in commons research

Although the conventional topics, or the 'big five' (fishery, forestry, irrigation, water management and animal husbandry), continue to absorb a significant chunk of the interest of the research community, we also observe the growing importance of several newer fields of scholarly interest. The rise in publications related to biodiversity, climate change, intellectual property and copyrights, and especially commons related to computers, software, and the internet (figure 5) seems to illustrate this point, although the numbers are still too low to know for certain whether or not we are dealing with emerging trends.⁶ Regardless, we stress the importance of studying newer issues such as the atmosphere, biodiversity, and digital resources in general, with the internet being a specific form of a digital resource.

An important observation derived from this search of the articles in refereed journals is related to the scattered nature of publication outlets. While it is positive that articles on the commons have appeared in a very wide array of peer-reviewed journals, this dispersion may at the same time hinder the accumulation of knowledge and the cross-fertilization that is crucial to the success of inter-disciplinary endeavors. The articles in the data base that resulted from our web-search were published in well over 2,000 different journals. Granted, almost half of these journals published only one article related to our topic of interest, but more than 250 different journals, however, showed sustained commitment to the commons, and published ten or more articles related to this topic since the landmark meetings held in the mid 1980s. Figure 6 displays the 16 journals that published 50 or more relevant articles between 1985 and 2005.

Whereas it is a positive sign that so many journal editors have recognized the importance and relevance of using a commons lens to look at a wide variety of

⁶ We identified titles that explicitly include terms related to either one of these 5 topics.

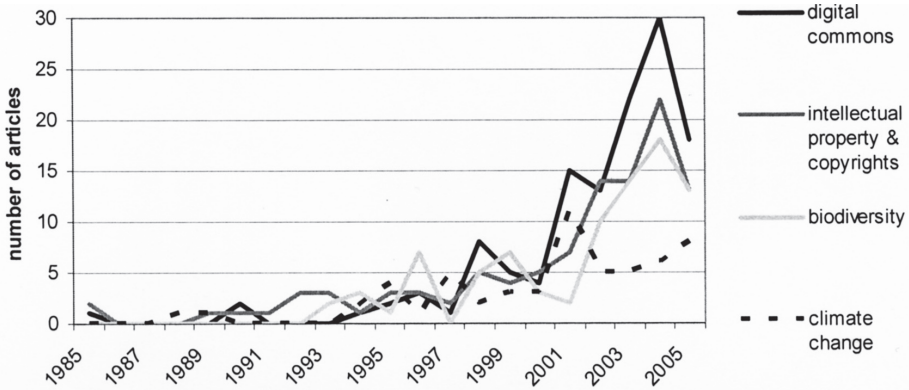


Figure 5: The emergence of ‘new’ topics in the study of the commons?

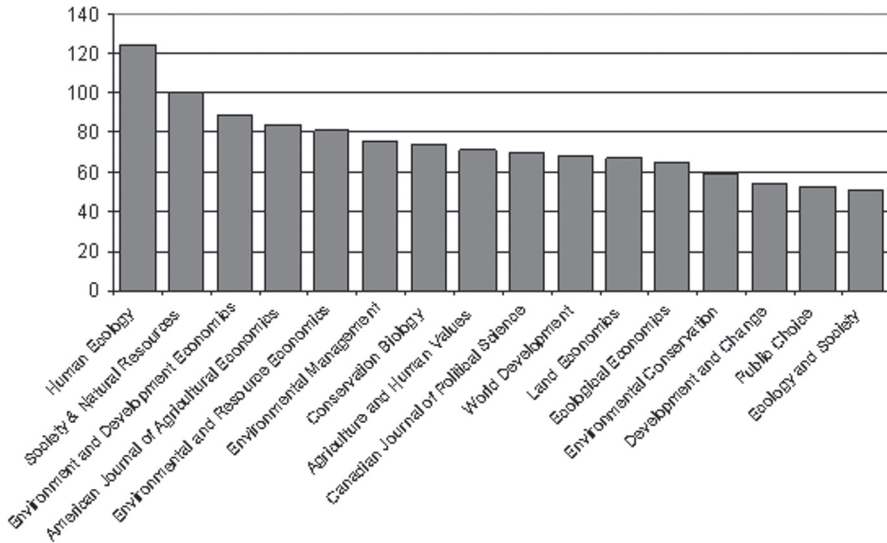


Figure 6: Journals that published at least 50 articles on the commons between 1985 and 2005

issues, the scattered pattern of publications may also complicate the emergence of a research community in which the members are aware of each others’ findings. This is one of the reasons for the establishment of the International Journal of the Commons. We sincerely hope that scholars will in the future continue to publish articles on the commons in a wide diversity of journals. We also hope that the establishment of a journal with a concentrated focus on the commons will enable scholars to achieve faster and more substantial growth in our knowledge of theoretical and empirical questions related to the commons.

3. Taking stock and looking ahead

Members of the scholarly community studying the commons overtly looked back to take stock of achievements and looked forward to identify what remained to be done in the mid 1980s and again in 2002. NRC (1986), McCay and Acheson (1987b), and NRC (2002) provide a reflection of these respective efforts. Bromley (1992) offers a faithful reflection of the 1985 NRC conference in Annapolis. In this volume, Feeny (1992) asks the question: Where do we go from here? That same question was asked again by Stern et al. (2002) when they wrapped up the compilation of contributions to the 2002 NRC report. This first issue of the *International Journal of the Commons* is a (very) modest repeat of the stand-still-take-stock-and-look-ahead exercises that have become a tradition in the field, and that we think are important. Where do we come from, what have we learned, and what should we be looking for in the future, both methodologically and theoretically?

Looking back at the 1985 Annapolis Conference – where a diverse set of high-quality case-studies, representing a variety of resource types and regions, was presented and discussed – Feeny was at the time mostly concerned with the methodologies used to understand what were, at that time, referred to as common-property resources and their governance. He urged scholars not only to engage in retrospective and prospective data collection to conduct single-case studies, but also undertake comparative analyses and to explore the possibilities of laboratory and field experiments. Furthermore, he acknowledged the value of Oakerson's effort to start drawing a taxonomic framework (Oakerson 1986); an appreciation of an approach that has over time matured into a more fully specified and tested framework (e.g. Ostrom 2005).

By 2002, Stern et al.'s main concern was not entirely methodological. The initial emphasis on single case studies was now balanced by more comparative studies (Agrawal and Yadama 1997; Ostrom 1990), and field and laboratory experiments had begun earning their place in the methods toolkit (Cardenas, Stranlund, and Willis 2000; Falk, Fehr, and Fishbacher 2002; Kopelman, Weber and Messick 2002; Ostrom, Gardner, and Walker 1994).⁷ Besides a more varied methodological take on the study of the commons, a more coherent theoretical research agenda had also begun to take definitive shape. By the time the NRC panel looked at the topic of the commons for the second time, several distinguished scholars had proposed sets of independent variables that they thought – based on thorough empirical work – affected the probability of 'success' for sustained common-pool resource governance (Agrawal 2002; Baland and Platteau 1996; Ostrom 1990;

⁷ The initial steps in the field were heavily guided by what might be called an empirical approach – with an important role for case-studies. NRC 1986 (Arnold and Campbell 1986; Artz and Norton 1986; Berkes 1986; Blaikie, Harriss, and Pain 1986; Campbell 1986; Cordell and McKean 1986; Cruz 1986; Easter and Palanisami 1986; Fortman and Roe 1986; Gilles, Hammoudi, and Mahdi 1986; Hunt 1986; Jessup and Peluso 1986; Kisangani 1986; Mahdi 1986; McKean 1986; Messerschmidt 1986; Wade 1986; Wynne 1986); McCay and Acheson 1987 (Acheson 1987; Anderson Jr. 1987; Bauer 1987; Berkes 1987; Brightman 1987; Carrier 1987; Durrenberger and Pålsson 1987; Fernandez 1987; Peters 1987; Stocks 1987; Taylor 1987; Vondal 1987).

Wade 1988). Also, Oakerson's initial taxonomic framework was by now on its way to developing into a more full-fledged Institutional Analysis and Development (IAD) framework (Ostrom et al. 1994).⁸

Stern et al. (2002) proposed to continue down this path in order to systematically develop knowledge. In addition, they identified a number of 'key understudied issues'. They urged the research community to look at the dynamics of resource management institutions, to extend insights to a broader array of common-pool resources, to appreciate more the effects of social and historical contexts, and to be more aware of embedded institutional arrangement and to study institutional linkages. In this issue of the *International Journal of the Commons*, the reader will find examples of articles written by authors who have taken most of these recommendations to heart. We have sought a balance between empirical work and theory building and this issue's contributions include a mix of comparative case studies, and more theoretical work.

4. Uncertainty, complexity, and institutions

Several chapters in *The Drama of the Commons* (2002), discussed the 'emerging issues' that would be important for scholars of the commons to examine more fully in the future. The contributions by McCay (2002), Wilson (2002), Young (2002), and Berkes (2002) all urged that scholars dedicate more time and effort to the understanding of complexity, uncertainty and institutions.⁹

Complexity can refer to the ecological system itself (e.g. the ocean system – (Wilson in this issue), the atmosphere, climate systems, etc.), or it can also refer to complex, linked and embedded social systems that operate at different scales of aggregation and are differentially affected by system outcomes. Or, complexity may refer to interaction between ecological and social systems. The study of one group of people governing a single-use common pool resource is 'less' complex than studying governance arrangements of different groups utilizing a set of multiple-use commons (Bassett, Blanc-Pamard and Boutrais 2007; Batterbury 1998; Edwards and Steins 1998; Steins and Edwards 1999). Households that use a mix of various private as well as multiple common-property resources simultaneously

⁸At the same pace this pragmatic, lessons-learned approach has always been accompanied by equally important parallel attempts to answer the central theoretical questions that underlie commons dilemmas: NRC 1986 (Bromley 1986; Feeny 1986; Gupta 1986; Oakerson 1986; Ostrom 1986; Runge 1986; Thomson, Feeny, and Oakerson 1986); McCay and Acheson (McCay 1987; McCay and Acheson 1987a, 1987b; Ostrom 1987; Pinkerton 1987; Townsend and Wilson 1987); NRC 2002 (Agrawal 2002; Bardhan and Dayton-Johnson 2002; Berkes 2002; Dietz et al. 2002; Falk et al. 2002; Kopelman et al. 2002; McCay 2002; Richerson, Boyd, and Paciotti 2002; Rose 2002; Stern et al. 2002; Tietenberg 2002; Wilson 2002; Young 2002)

⁹In a sense much of the work on commons is about institutional design, but not really about institutional dynamics. We know relatively little about institutional change, especially through long term studies of institutions. Much of the existing research on the commons is based on single time period studies.

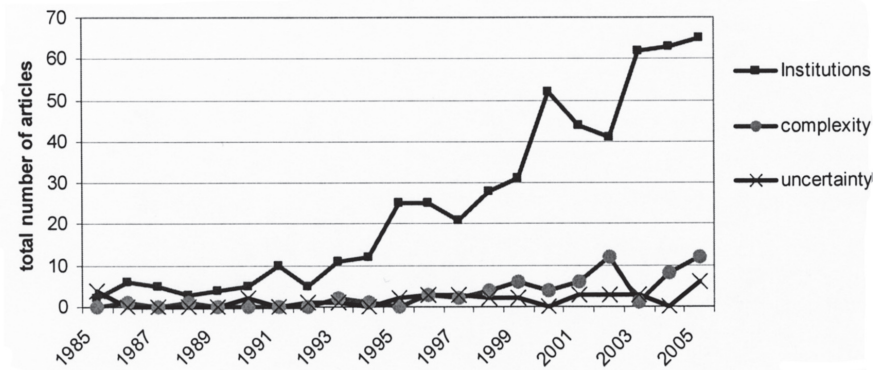


Figure 7: Trends in scholarly attention to institutions, complexity and uncertainty

for their livelihoods face complex choices, too (McGrath, Almeida, and Merry 2007; Scoones 1998). Not surprisingly, most research until now has focused on single-group governance of single-use commons. Given the fact that multi-group use of multi-use commons is frequently found in the ‘real’ world, we agree with the call for a keener eye for complexity.

Uncertainty and complexity are related. Uncertainty can refer to unpredictability of outcomes of complex ecological systems – many contemporary models do not include the non-linear causal relations in many ecological system configurations. It can also refer to the indeterminacy in social systems that emerges when ‘institutional arrangements leave open wide avenues for choice, and each individual’s outcome is dependent upon the action of others’ (Ostrom 2005, pp. 48-49). Uncertainty can also refer to the uncertain outcomes of complex interactions between social and ecological systems. A promising line of scholarly inquiry has taken on the challenge of giving complexity and uncertainty a clear place in theoretical and empirical research, mainly by focusing on processes of adaptation in social-ecological systems (SESs). In this issue, Wilson, Janssen, and Anderies; McGrath; Almeida and Merry; and Kerr, respectively, all explicitly deal with questions related to complexity and uncertainty.

How uncertainty and complexity are tied to institutional dynamics and institutional design is a question more explicitly dealt with by Agrawal and Njaya, respectively, in this issue.

It is difficult to assess whether these topics are receiving growing attention from the research community. We searched our database for the occurrence of the words ‘uncertain,’ ‘complex,’ and ‘institution,’ an admittedly surface search, and the results are presented in Figure 7. It would appear from this simple search that the tradition of work in institutional analysis continues to grow over time while less effort is devoted to the study of uncertainty and complexity overtly.

Here, we reiterate the call expressed by several in the NRC (2002) volume for a focus on institutions, complexity, and uncertainty, and tried to let that be one of the guiding criteria for the selection of our papers. Hence, many of the articles in this introductory issue do address one or more of these three issues as we discuss below.

5. Selection criteria for the articles in this issue

When we were asked to act as guest-editors for the first issues of this journal, we decided to organize two special panels during the 11th biannual IASCP Conference in Bali, Indonesia (19-23 June 2006). We invited authors of paper proposals that we thought had the potential to meet the selection criteria we had in mind for the compilation of a coherent set of journal articles. Draft versions of most of the articles published in this issue were presented and discussed during the panels in Bali, and then given an extensive review by us as editors, and by excellent external reviewers.

What is the rationale behind our selection of the set of papers in this first issue of the *International Journal of the Commons*? First, we wanted this inaugural issue to reflect, in an admittedly modest way, what we have learned so far. Second, we wanted to achieve this objective through a balanced bundle of articles that represent two equally important approaches to our field: a more hands-on, empirical tradition and inquiry that delves into more theoretical questions. Third, looking to the future we feel at this juncture that it is crucial to embrace more fervently the study of uncertainty, complexity, and institutions. We included a set of articles that explicitly deal with these three issues.

6. An overview of the articles in this issue

The papers in this first issue are written by authors from diverse disciplines that use multiple methods of analysis. They range from theoretical analyses of complex and uncertain common pool resource (CPR) settings to a focus on empirical analysis of the impact of diverse institutional arrangements on the patterns of use by households and user groups of shared resources over time.

James Wilson's contribution – *Scale and Costs of Fishery Conservation* shows how about the way in which social systems affect ecological systems – combined with related to scale issues – complicate to govern the use of oceans (Wilson 2007). The ocean system is more complex than imagined. Even two or three decades ago, this intrinsic complexity made it hard to develop theories to guide observations. Getting a grip of the ocean's complexity is furthermore hindered by the fact that observations of the ocean are indirect, episodic and costly, and traditional knowledge systems – knowledge gathered by fishers – tend to be closed and secretive.

Related to the oceans' complexity, there exists much uncertainty about both the component- and system-wide implications of our use of the oceans. Wilson identifies two scientific traditions that differ in the way they deal with this uncertainty. A first, species-specific, deterministic perspective is implicitly based on the notion that individual stocks can be treated as nearly independent of the whole system. The importance of interactions – both within the ecological system and between ecological and social systems – is emphasized in a second approach, which draws more on developments in ecology. Paradoxically, while diverse approaches are generally regarded as beneficial when facing uncertainty, scientific agnosticism also stymies people's willingness to engage in the collective action that is so important for 'good' governance.

Complexity and uncertainty have serious implications for institutional design. In this context, Wilson refers to the importance of 'scale.' To be meaningful for the governance of the use of the resource system, the costs of gathering information at fine ecological and temporal scales are generally too high, and acquiring useful information at a system level is generally too slow. He also recognizes the importance of an ability to learn and adapt. The design of a system of rights that provide inadequate feedback – a realistic scenario given the uncertainty stemming from complexity – might lead actors down a path of further resource deterioration.

Wilson identifies two main challenges regarding institutional design for ocean governance. Both are related to the friction between ecological scales and temporal dynamics, and thus the challenge of increasing the breadth of our adaptive capacity. First, we need to deal with the fact that costly observation and enforcement narrows the set of available rules. Second, we need to increase the ecological scope of private information provided to public processes. In conclusion, Wilson holds that we have to acknowledge that there are aspects of natural systems for which we cannot acquire quantitative knowledge. In those instances, he argues, 'we have to move to institutional arrangements in which personal relationships are able to develop trust and assurances.'

Marco Janssen and John Anderies, overtly take on the difficult challenge of analyzing uncertainty in complex Social-Ecological Systems (SESs) in their paper *Robustness Trade-offs in Social-Ecological Systems* (Janssen and Anderies 2007). They view all common-pool resources used by humans from this SES perspective – a perspective that has until recently involved more ecologists than social scientists (Berkes and Folke 1998; Gunderson and Holling 2002; Gunderson, Holling, and Light 1995; Hanna, Folke, and Mäler 1996; Holling 1973). They analyze the problem of achieving robust institutional arrangements – robustness meaning 'the capacity to *continue* to meet a performance objective in the face of uncertainty and shocks.'

In any uncertain environment, those who design and implement institutional arrangements face difficult tradeoffs between achieving high performance related to efficient, long-term resource sustainability as well as an equitable and accountable distribution of benefits and costs. Achieving effective performance is a dif-

difficult challenge, but attempting to protect the SES from a range of uncertain, harmful shocks that may occur in the future makes decisions about rules and management strategies even more difficult. They illustrate the inevitable trade-offs between achieving high levels of current performance and preparing for a diversity of potential future disturbances with theoretical models.

Janssen and Anderies then illustrate the applicability of their analysis with two examples of well-known irrigation systems. The first example is the Bali irrigation systems – a long-surviving, complex system that has been extensively studied and documented by Steven Lansing (1991; 2006). The Bali system is an example of a series of small-scale, self-organized irrigation systems linked together via infrastructure and the shared beliefs of priests and farmers in how to manage these systems. The second is the Goulburn Broken Valley in Australia, which Janssen and Anderies consider to be a typical example of a contemporary, large-scale irrigation system, whose impact on the landscape has been substantial. Both types of systems face difficult tradeoffs between efforts to increase agricultural production, providing equitable distribution of outcomes and maintaining the infrastructure and landscape as well as facing many uncertain disturbances over time. In light of their theory and exploration of well-known empirical cases, they stress the error of much contemporary policy analysis that builds institutional and physical infrastructure on the presumption that the future distribution of uncertain events is well known. They conclude that understanding the robustness trade-offs associated with the design of new social and physical infrastructures is a crucial element of good policy development.

In their paper entitled *The Influence of Community Management Agreements on Household Economic Strategies: Cattle Grazing and Fishing Agreements on the Lower Amazon Floodplain*, David McGrath, Oriana Almeida, and Frank Merry (2007) also take on the challenges of complexity and uncertainty discussed above. By conducting research on two sectors (grazing and fishing) and two levels of analysis (household and community) over multiple years, the authors undertake a type of analysis that could not have been undertaken in the mid 1980s. The authors examine how community management arrangements for two ecological systems in the Amazon floodplains affect household decisions. Three activities – cattle ranching, annual cropping on the borders of the waterways, and fishing in the lakes – are all essential activities for household survival providing both food for household consumption and cash income. Raising cattle also is a form of savings since cattle do not need to be sold annually and can be held to meet family emergencies or other investment opportunities.

McGrath and colleagues identify two overlapping eras related to the development of institutions for managing these inter-related resource systems. From the mid 1980s to the turn of the century, efforts were extensively devoted to overcoming a decline in the productivity of fishing efforts – something that directly affects immediate household consumption. During this era, households made costly

short-term sacrifices when they were relatively confident in the capability of their collective agreement and the resource system itself to increase the productivity of the fisheries. More recently, the substantial increase in cattle ranching has led to a decline of the productivity of the floodplain fisheries as well as threatening the pasture lands themselves. While many households have a stronger orientation to protecting their right to cattle – which they own as a private good and increases long-term financial security, losing their fisheries would be a substantial loss for most households, which had earlier motivated substantial investment in rules related to the fishery itself.

Thus, the households in the lower Amazon face do not simply face a tradeoff between short-term benefits and long-term returns in one sector, but rather how essential competing household needs can also taken into account in the design of rules at the collective level. This challenge is intensified by uncertainty regarding their property rights over the fishery. They illustrate how some groups have increased the confidence of participating households in long-term viability of their system by using participatory monitoring techniques thus increasing their willingness to make further short-term investments in a less uncertain future.

John Kerr's article on watershed management entitled *Watershed Management: Lessons from Common Property Theory* is an example of an analysis that explores the challenges of institutional design in a context characterized by complexity – complexity mainly stemming from scale issues (Kerr 2007). Although from a hydrological point of view that a watershed is a logical unit of analysis, it is less so from a perspective of social organization. Before the mid 1980s, commons researchers would naturally focus separately on forests, pastures, agricultural land, surface water, or groundwater. Today, Kerr is able to take on the challenge to undertake a study recognizing that in a watershed these individual SESs are not detached, but in fact nested within a larger system.

From an institutional design perspective, the relation between the micro and the macro level in watersheds is very similar to how fisheries relate to the larger ocean system (see Wilson in this issue). Governance at the macro level is likely to be more effective but at the same time less likely to happen; governance at a sub-village micro-watershed scale might not be as effective for the performance of the system as a whole – in some cases it might even be counter-productive – but it is much easier to realize in practice. This friction is caused by the fact that 'costs and benefits of management are distributed unevenly, yet cooperation is required to make it work.'

To illustrate this point, Kerr refers to several watershed management projects, mainly in India. The projects that are evaluated favorably, focus on village or sub-village level micro-watersheds, and have put emphasis on local organizational skills, and socioeconomic and biophysical particularities (reasons for which these projects can not automatically be 'up-scaled'). Those projects that had a focus on multi-village watersheds generally performed the worst.

Kerr challenges the overall applicability of some of the institutional ‘design principles’ discussed by Agrawal (2002), especially with the characteristics of a larger watershed in mind. For example, although the resource characteristics that presumably facilitate the emergence of sustainable governance systems might apply to one component within a watershed, they seldom apply to the watershed as a whole. The same goes for ‘principles’ referring to group characteristics and the relationship between the characteristics of the resource and its users. According to Kerr, the inherent friction between micro- and macro-watershed governance requires the design of institutional mechanisms that promote governance capacity both within and between micro-watersheds.

Arun Agrawal’s article on *Forests, Governance, and Sustainability: Common Property Theory and its Contributions* focuses intensively on the importance of institutional analysis for making policy decisions related to the world’s forests (Agrawal 2007). Agrawal undertakes an extensive review of the literature on property rights and their impacts and, in particular, how ownership rights to forests are distributed in diverse regions of the world. Given the importance of common property arrangements in developing countries, he also identifies major gaps in the theory and methods used to study forest-based commons.

Agrawal provides a strong focus on the nested sets of key variables identified in commons research and how important it is for researchers to be aware of theoretical frameworks that would enable them to conduct research that is far more cumulative over time. This is especially true given the findings that government ownership, private ownership, and community ownership have all succeeded as well as failed to insure long-term sustainable forests. Since successes and failures of any of these generalized institutional arrangements can occur within the same country at the same time, scholars need to be much more aware of relevant contextual variables that affect the likelihood of success and/or failure of the institutional arrangement. Many papers concentrate on a limited set of variables of particular interest to the researcher and do not try to include a broader set that may help explain developments in a comparative frame.

After a major review of recent policy documents, Agrawal expresses a deep concern that the extensive knowledge accumulated by scholars of the commons related to forestry is not being used in regard to major efforts to halt deforestation around the world. For example, he examines the recent FAO Global Forest Resources Assessment (2005) and finds only a miniscule discussion of research on commons or even much discussion of the importance of property rights and institutions as impacting forest conditions. He also notes that despite the extensive findings about the importance of forest commons for sustaining the livelihood of many of the poorest in the world, that the policy literature (e.g. Sachs 2005) on how to reduce poverty ignores research on forest commons. Agrawal thus illustrates the contributions of scholars of the commons as well as outlines and identifies the work that remains to be done in the future. The major note on which

Agrawal ends his review refers to the need for greater movement on data and methods in comparison to theory. He feels that we now have a lot of competing theories and potential explanations about what factors explain better performance of commons institutions (and indeed some clear areas of well developed knowledge as well), but our ability to move forward is limited by the lack of more and better data and methods to analyze large amounts of data.

Friday Njaya's paper, *Governance Challenges for the Implementation of Fisheries Co-management: Experiences from Malawi*, deals with fisheries (Njaya 2007). It takes a more critical look at the concept of 'co-management'. Co-management – a participatory approach to the governance of fisheries – became popular among donors, national governments, and practitioners in the 1990s after the realization that small-scale fish resources were dwindling. By zooming in on institutional dynamics and time-and-place particularities, Njaya puts his finger on some of the essential difficulties related to setting up co-management arrangements that are often overlooked by policy makers.

In order to get a grip of the institutional dynamics related to the design and implementation of co-management arrangements, Njaya pulls in the concept of 'governance.' Kooiman and Van Vliet (1993, p. 64) state that 'the governance concept points to the creation of a structure or an order which cannot be externally imposed but is the result of the interaction of a multiplicity of governing and each other influencing actors.' Granting voice to fishers and communities will alter the dynamics and possible outcomes of institutional arrangements. We cannot however expect to understand fully all local governance configurations, meaning that implementing 'co-management' as a blueprint is not likely to be effective (see also Kerr in this issue, when he refers to the difficulty of 'up-scaling' micro-watershed projects). In this context it makes sense to refer again to the Institutional Analysis and Development framework that – summarized in very broad strokes – holds that the ultimate outcome of interactions and exchanges in the local polity depends on the place-specific bio-physical environment, the preferences and roles of all relevant policy actors as determined by the specific socioeconomic context, and the dynamics of local institutional arrangements – the nestedness of the local policy arena within a larger institutional setting included (Ostrom 2005).

Exploring institutional dynamics and the impact thereof for institutional design and implementation, Njaya ponders the need for clarity, flexibility, and attention for local particularities, assessed on a case-by-case basis. For example, local leaders may very well add legitimacy to participatory, co-management arrangements in some places, but may also undermine democracy and accountability in others. Or, the involvement of those affected by rules about resource use in the rule-making process, can positively affect the quality of rules and rule abidance in some places, but may just as well lead to the crafting of unsustainable rules and elite capture in others. Njaya argues that a greater role for local authorities should be sought. But again, he warns that decentralization is not the panacea that some seem to take it for.

7. Conclusion

In 2002, Barrett and Mabry conducted a major survey of biologists to determine which publications in the twentieth century had become classic books or benchmark publications in biology (Barrett and Mabry 2002). They report that Hardin's 1968 article was the one having the greatest career impact on biologists and the most frequently cited. Most students of environmental sciences read Hardin's article several times during their undergraduate programs. Careful game theoretical, experimental, and field research have shown Hardin's theory to be correct under specific and limited conditions. These conditions include participants that: (1) are fully anonymous, (2) have no property rights to the resource system, (3) cannot communicate, and (4) lack long-term interests in a resource (see Berkes and Hughes 2006; Olson 2000; Ostrom et al. 1994). The extensive over-exploitation of marine resources in the oceans is a clear example of 'the tragedy of the commons.'

Over time, however, extensive research undertaken by commons researchers has shown that Hardin's conclusion that centralized government or private solutions must be imposed on harvesters is not the only solution to the dilemma that Hardin identified.

Many alternative forms of property have repeatedly been found to work effectively when well matched to the attributes of the resource and the harvesters themselves, and when the resulting rules are enforced, considered legitimate, and generate long-term patterns of reciprocity. Cumulatively, we now provide an acknowledged and large set of viable alternatives to these appealingly simple but often faulty policy prescriptions. In spite of Hardin's persistent metaphor, today many people, ranging from policy makers, donors, practitioners, and citizen activists, to scientists from different disciplines, have begun to appreciate that there is a world of nuances between the State and the Market.

We hope that the International Journal of the Commons will provide a platform where scholars and practitioners from different disciplines can pursue a variety of empirical and theoretical approaches to the study of the commons and share their results. Also, we hope that besides a continued attention to the more traditional sectors (e.g. irrigation, water, fishery, forestry, animal husbandry), this journal will offer a podium to those with an interest in developing our understanding of emerging topics that can also be meaningfully captured through a commons framework (e.g. the atmosphere, the internet, and biodiversity). Finally, we hope that this journal will encourage scholars and practitioners to further our appreciation of the role of uncertainty, complexity and institutions. Without such appreciation, scholars are likely to retreat behind recommendations of overly simplistic panaceas for 'curing' the tragedy of the commons (Ostrom 2007) leading to outcomes in some cases that destroy self-organized solutions that do not fit preconceived notions of an 'optimal' solution.

A stellar example of the success of the many scholars who have contributed to the growing literature on the commons is the recent book edited by Donald

Kennedy entitled *The State of the Planet 2006-2007*, in which an entire section is devoted to 'Managing our Common Inheritance.' In the introduction of this section of the book, Kennedy refers positively to the 'wave of scholarship that has arisen in synchrony with the environmental movement that was barely beginning at the time Hardin wrote' (Kennedy 2007, p. 104). As Kennedy reflects, we are able to formulate questions – and some answers – related to how to govern the commons more clearly after four decades of work. We have not yet, however, arrived at answers to all of the important questions. Respecting a long academic tradition, our final conclusion will therefore be that more research is required. We are confident that this new journal will play an important role in encouraging and disseminating this research.

Literature cited

- Acheson, J. M. 1987. The Lobster Fiefs Revisited. Economics and Ecological Effects of Territoriality in Maine Lobster Fishing. In *The Question of the Commons. The Culture and Ecology of Communal Resources*, eds. B. J. McCay and J. M. Acheson, 37-65. Tucson, Arizona: The University of Arizona Press.
- Agrawal, A. 2002. Common Resources and Institutional Sustainability. In *The Drama of the Commons*, ed. National Resource Council, 41-86. Washington, D.C.: National Academy Press.
- Agrawal, A. 2007. Forests, Governance, and Sustainability: Common Property Theory and its Contributions. *International Journal of the Commons*, 1(1).
- Agrawal, A. and G. N. Yadama. 1997. How Do Local Institutions Mediate Market and Population Pressures on Resources? Forest Panchayats in Kumaon, India. *Development and Change* 28(3):435-465.
- Anderson Jr., E. N. 1987. A Malaysian Tragedy of the Commons. In *The Question of the Commons. The Culture and Ecology of Communal Resources*, eds. B. J. McCay and J. M. Acheson, 327-343. Tucson, Arizona: The University of Arizona Press.
- Arnold, J. E. M., and J. G. Campbell. 1986. Collective Management of Hill Forests in Nepal: The Community Forestry Development Project. In *Proceedings of the Conference on Common Property Resource Management, Annapolis Maryland, April 21-26, 1985*, ed. National Research Council, 425-454. Washington, D.C.: National Academy Press.
- Artz, N. E., and B. E. Norton. 1986. Management of Common Grazing Lands: Tamahdite, Morocco. In *Proceedings of the Conference on Common Property Resource Management, Annapolis Maryland, April 21-26, 1985*, ed. National Research Council, 259-280. Washington, D.C.: National Academy Press.
- Baland, J. -M., and J. -P. Platteau. 1996. *Halting Degradation of Natural Resources. Is There a Role for Rural Communities?* Oxford: Clarendon Press.

- Bardhan, P., and J. Dayton-Johnson. 2002. Unequal Irrigators: Heterogeneity and Commons Management in Large-Scale Multivariate Research. In *The Drama of the Commons*, ed. National Resource Council, 87-112. Washington, D.C.: National Academy Press.
- Barrett, G. W. and K. E. Mabry. 2002. Twentieth-Century Classic Books and Benchmark Publications in Biology. *BioScience* 52(3):282-286.
- Bassett, T. J., C. Blanc-Pamard, and J. Boutrais. 2007. Constructing Locality: The *Terroir* approach in West Africa. *Africa* 77(1):104-129.
- Batterbury, S. 1998. Local Environmental Management, Land Degradation and the 'Gestion des Terroirs' Approach in West-Africa: Policies and Pitfalls. *Journal of International Development* 10:871-898.
- Bauer, D. 1987. The Dynamics of Communal Hereditary Land Tenure Among the Tigray of Ethiopia. In *The Question of the Commons. The Culture and Ecology of Communal Resources*, ed. B. J. McCay and J. M. Acheson, 217-230. Tucson, Arizona: The University of Arizona Press.
- Berkes, F. 1986. Marine Inshore Fishery Management in Turkey. In *Proceedings of the Conference on Common Property Resource Management, Annapolis Maryland, April 21-26, 1985*, ed. National Research Council, 63-84. Washington, D.C.: National Academy Press.
- Berkes, F. 1987. Common-Property Resource Management and Cree Indian Fisheries in Subarctic Canada. In *The Question of the Commons. The Culture and Ecology of Communal Resources*, ed. B. J. McCay and J. M. Acheson, 66-91. Tucson, Arizona: The University of Arizona Press.
- Berkes, F. 2002. Cross-Scale Institutional Linkages: Perspectives from the Bottom Up. In *The Drama of the Commons*, ed. National Resource Council, 293-321. Washington, D.C.: National Academy Press.
- Berkes, F., and C. Folke, ed. 1998. *Linking Social and Ecological Systems. Management Practices and Social Mechanisms for Building Resilience*. Cambridge, UK: Cambridge University Press.
- Berkes, F., and T. P. Hughes. 2006. Globalization, Roving Bandits, and Marine Resources. *Science* 311(March 17):1557-1558.
- Blaikie, P. M., Harriss, J. C., and A. N. Pain. 1986. The Management and Use of Common Property Resources in Tamil Nadu, India. In *Proceedings of the Conference on Common Property Resource Management, Annapolis Maryland, April 21-26, 1985*, ed. National Research Council, 481-504. Washington, D.C.: National Academy Press.
- Brightman, R. A. 1987. Conservation and Resource Depletion: The Case of the Boreal Forest Algonquians. In *The Question of the Commons. The Culture and Ecology of Communal Resources*, ed. B. J. McCay and J. M. Acheson, 121-141. Tucson, Arizona: The University of Arizona Press.

- Bromley, D. W. 1986. The Common Property Challenge. In *Proceedings of the Conference on Common Property Resource Management, Annapolis Maryland, April 21-26, 1985*, ed. National Research Council, 1-6. Washington, D.C.: National Academy Press.
- Bromley, D. W., ed. 1992. *Making the Commons Work. Theory, Practice and Policy*. San Francisco, CA: ICS Press.
- Campbell, B. M. S. 1986. Commonfield Agriculture: The Andes and Medieval England Compared. In *Proceedings of the Conference on Common Property Resource Management, Annapolis Maryland, April 21-26, 1985*, ed. National Research Council, 323-358. Washington, D.C.: National Academy Press.
- Cardenas, J. C., J. Stranlund, and C. Willis. 2000. Local Environmental Control and Institutional Crowding-out. *World Development*, 28(10):1719-1733.
- Carrier, J. G. 1987. Marine Tenure and Conservation in Papua New Guinea: Problems in Interpretation. In *The Question of the Commons. The Culture and Ecology of Communal Resources*, eds. B. J. McCay and J. M. Acheson, 142-170. Tucson, Arizona: The University of Arizona Press.
- Cordell, J. C., and M. McKean. 1986. Sea Tenure in Bahia, Brazil. In *Proceedings of the Conference on Common Property Resource Management, Annapolis Maryland, April 21-26, 1985*, ed. National Research Council 85-114. Washington, D.C.: National Academy Press.
- Coward, E. W. 1980. Principles of Social Organization in an Indigenous Irrigation System. *Human Organization*, 38:28-36.
- Cruz, W. D. 1986. Overfishing and Conflict in a Traditional Fishery: San Miguel Bay, Philippines. In *Proceedings of the Conference on Common Property Resource Management, Annapolis Maryland, April 21-26, 1985*, ed. National Research Council, 115-136. Washington, D.C.: National Academy Press.
- De los Reyes, R. P. 1980. *Communal Gravity Systems: Organizational Profiles*. Quezon City: Institute of Philippine Culture.
- De Moor, M., L. Shaw-Taylor and P. Warde. 2002. *The Management of Common Land in North West Europe, c. 1500-1850*. Turnhout, Belgium: Brepols Publishers.
- Dietz, T., Dolšak, N., E. Ostrom, and P. N. Stern. 2002. The Drama of the Commons. In *The Drama of the Commons*, ed. National Resource Council, 3-35. Washington, D.C.: National Academy Press.
- Durrenberger, E. P. and G. Pálsson. 1987. The Grass Roots and the State: Resource Management in Icelandic Fishing. In *The Question of the Commons. The Culture and Ecology of Communal Resources*, eds. B. J. McCay and J. M. Acheson, 370-392. Tucson, Arizona: The University of Arizona Press.
- Easter, K. W., and K. Palanisami. 1986. Tank Irrigation in India: An Example of Common Property Resource Management. In *Proceedings of the Conference on Common Property Resource Management, Annapolis Maryland, April 21-26, 1985*, ed. National Research Council, 215-230. Washington, D.C.: National Academy Press.

- Edwards, V. M. and N. A. Steins. 1998. Developing an Analytical Framework for Multiple-Use Commons. *Journal of Theoretical Politics*, 10(3):347-383.
- Falk, A., E. Fehr, and U. Fishbacher. 2002. Appropriating the Commons: A Theoretical Explanation. In *The Drama of the Commons*, ed. National Resource Council, 157-191. Washington, D.C.: National Academy Press.
- Feeny, D. 1986. Conference on Common Property Resource Management: An Introduction. In *Proceedings of the Conference on Common Property Resource Management, Annapolis Maryland, April 21-26, 1985*, ed. National Research Council, 7-12. Washington, D.C.: National Academy Press.
- Feeny, D. 1992. Where Do We Go From Here? Implications for the Research Agenda. In *Making the Commons Work. Theory, Practice and Policy*, ed. D. W. Bromley, 267-292. San Francisco, CA: ICS Press.
- Fernandez, J. W. 1987. The Call to the Commons: Decline and Recommitment in Austuria, Spain. In *The Question of the Commons. The Culture and Ecology of Communal Resources*, eds. B. J. McCay and J. M. Acheson, 266-289. Tucson, Arizona: The University of Arizona Press.
- Food and Agriculture Organization (FAO). 2005. *Global Forest Resources Assessment*. Rome: Food and Agriculture Research Organization.
- Fortman, L. R. and E. M. Roe. 1986. Common Property Management of Water in Botswana. In *Proceedings of the Conference on Common Property Resource Management, Annapolis Maryland, April 21-26, 1985*, ed. National Research Council, 161-180. Washington, D.C.: National Academy Press.
- Gilles, J. L., A. Hammoudi, and M. Mahdi. 1986. Oukaimedene, Morocco: A High Mountain Agdal. In *Proceedings of the Conference on Common Property Resource Management, Annapolis Maryland, April 21-26, 1985*, ed. National Research Council, 281-304. Washington, D.C.: National Academy Press.
- Gunderson, L. H. and C. S. Holling, eds. 2002. *Panarchy: Understanding Transformations in Human and Natural Systems*. Washington, D.C.: Island Press.
- Gunderson, L. H., C. S. Holling, and S. S. Light, eds. 1995. *Barriers and Bridges to the Renewal of Ecosystems and Institutions*. New York: Columbia University Press.
- Gupta, A. K. 1986. Socioecology of Stress: Why do Common Property Resource Management Projects Fail? In *Proceedings of the Conference on Common Property Resource Management, Annapolis Maryland, April 21-26, 1985*, ed. National Research Council, 305-322. Washington, D.C.: National Academy Press.
- Hanna, S. S., C. Folke, and K. -G. Mäler, eds. 1996. *Rights to Nature. Ecological, Economic, Culture, and Political Principles of Institutions for the Environment*. Washington, D.C.: Island Press.
- Hardin, G. 1968. The Tragedy of the Commons. *Science*, 162:1243-1248.

- Hess, C. and R. Meinzen-Dick. 2006. The Name Change, or, What Happened to the P? *The Commons Digest*, 2(December):1-4.
- Holling, C. S. 1973. Resilience and Stability of Ecological Systems. *Annual Review of Ecology and Systematics*, 4:1-23.
- Hunt, R. C. 1986. Canal Irrigation in Egypt: Common Property Management. In *Proceedings of the Conference on Common Property Resource Management, Annapolis Maryland, April 21-26, 1985*, ed. National Research Council, 199-214. Washington, D.C.: National Academy Press.
- Janssen, M. A. and J. M. Anderies. 2007. Robustness Trade-Offs in Social-Ecological Systems. *International Journal of the Commons*, 1(1).
- Jessup, T. C. and N. L. Peluso. 1986. Minor Forest Products as Common Property Resources in East Kalimantan, Indonesia. In *Proceedings of the Conference on Common Property Resource Management, Annapolis Maryland, April 21-26, 1985*, ed. National Research Council, 505-532. Washington, D.C.: National Academy Press.
- Johnson, C. 2004. Uncommon Ground: The 'Poverty of History' in Common Property Discourse. *Development and Change*, 35(3):407-433.
- Kennedy, D. 2007. Managing Our Common Inheritance. In *State of the Planet 2006-2007*, eds. D. Kennedy & the editors of *Science Magazine*, 101-114. Washington, D.C.: Island Press.
- Kerr, J. 2007. Watershed Management: Lessons From Common Property Theory. *International Journal of the Commons*, 1(1).
- Kisangani, E. 1986. A Social Dilemma in a Less Developed Country: The Massacre of the African Elephant in Zaire. In *Proceedings of the Conference on Common Property Resource Management, Annapolis Maryland, April 21-26, 1985*, ed. National Research Council 137-160. Washington, D.C.: National Academy Press.
- Kooiman, J. and M. van Vliet. 1993. Governance and Public Management. In *Managing Public Organizations*, eds. K. Eliassen and J. Kooiman, London: Sage.
- Kopelman, S., J. M. Weber, and D. M. Messick. 2002. Factors Influencing Cooperation in Commons Dilemmas: A Review of Experimental Psychological Research. In *The Drama of the Commons*, ed. National Resource Council, 113-156. Washington, D.C.: National Academy Press.
- Lansing, J. S. 1991. *Priests and Programmers: Technologies of Power in the Engineered Landscape of Bali*. Princeton, NJ: Princeton University Press.
- Lansing, J. S. 2006. *Perfect Order*. Princeton, NJ: Princeton University Press.
- MacKenzie, W. C. 1979. Rational Fishery Management in a Depressed Region: The Atlantic Groundfishery. *Journal of the Fisheries Research Board of Canada*, 36:811-826.
- Mahdi, M. 1986. Private Rights and Collective Management of Water in a High Atlas Berber Tribe. In *Proceedings of the Conference on Common Property*

- Resource Management, Annapolis Maryland, April 21-26, 1985*, ed. National Research Council, 181-198. Washington, D.C.: National Academy Press.
- McCay, B. J. 1987. The Culture of the Commoners: Historical Observation on Old and New World Fisheries. In *The Question of the Commons. The Culture and Ecology of Communal Resources*, eds. B. J. McCay and J. M. Acheson, 195-216. Tucson, Arizona: The University of Arizona Press.
- McCay, B. J. 2002. Emergence of Institutions for the Commons: Contexts, Situations, and Events. In *The Drama of the Commons*, ed. National Resource Council, 361-402. Washington, D.C.: National Academy Press.
- McCay, B. J. and J. M. Acheson. 1987a. Human Ecology of the Commons. In *The Question of the Commons. The Culture and Ecology of Communal Resources*, eds. B. J. McCay and J. M. Acheson 1-36. Tucson, Arizona: The University of Arizona Press.
- McCay, B. J. and J. M. Acheson, eds. 1987b. *The Question of the Commons. The Culture and Ecology of Communal Resources*. Tucson, Arizona: The University of Arizona Press.
- McGrath, D. G., M. Almeida, and F. D. Merry. 2007. The Influence of Community Management Agreements on Household Economic Strategies: Cattle Grazing and Fishing Agreements on the Lower Amazon Floodplain. *International Journal of the Commons*, 1(1).
- McKean, M. A. 1986. Management of Traditional Common Lands (Iriaichi) in Japan. In *Proceedings of the Conference on Common Property Resource Management, Annapolis Maryland, April 21-26, 1985*, ed. National Research Council, 533-590. Washington, D.C.: National Academy Press.
- Messerschmidt, D. A. 1986. People and Resources in Nepal: Customary Resource Management Systems of the Upper Kali Gandaki. In *Proceedings of the Conference on Common Property Resource Management, Annapolis Maryland, April 21-26, 1985*, ed. National Research Council, 455-480. Washington, D.C.: National Academy Press.
- National Research Council. 1986. *Proceedings of the Conference on Common Property Resource Management, Annapolis Maryland, April 21-26, 1985*. Washington, D.C.: National Academy Press.
- National Research Council, ed. 2002. *The Drama of the Commons*. Washington, D.C.: National Academy Press.
- Njaya, F. 2007. Governance Challenges for the Implementation of Fisheries Co-management: Experiences from Malawi. *International Journal of the Commons*, 1(1).
- Oakerson, R. J. 1986. A Model for the Analysis of Common Property Problems. In *Proceedings of the Conference on Common Property Resource Management, Annapolis Maryland, April 21-26, 1985*, ed. National Research Council, 13-30). Washington, D.C.: National Academy Press.
- Olson, M. 2000. *Power and Prosperity*. New York: Basic Books.

- Ostrom, E. 1986. Issues of Definition and Theory: Some Conclusions and Hypotheses. In *Proceedings of the conference on common property resource management, Annapolis Maryland, April 21-26, 1985*, ed. National Research Council, 597-614. Washington, D.C.: National Academy Press.
- Ostrom, E. 1987. Institutional Arrangements for Resolving the Commons Dilemma: Some Contending Approaches. In *The Question of the Commons. The Culture and Ecology of Communal Resources*, eds. B. J. McCay and J. M. Acheson, 250-265. Tucson, Arizona: The University of Arizona Press.
- Ostrom, E. 1990. *Governing the Commons: The Evolution of Institutions for Collective Action*. New York: Cambridge University Press.
- Ostrom, E. 2005. *Understanding Institutional Diversity*. Oxford: Princeton University Press.
- Ostrom, E. 2007. *A Diagnostic Approach for Going Beyond Panaceas*, Proceedings of the National Academy of Sciences.
- Ostrom, E., R. Gardner, and J. Walker. 1994. *Rules, Games, and Common-Pool Resources*. Ann Arbor: The University of Michigan Press.
- Peters, P. E. 1987. Embedded Systems and Rooted Models: The Grazing Lands of Botswana and the Commons Debate. In *The Question of the Commons. The Culture and Ecology of Communal Resources*, eds. B. J. McCay and J. M. Acheson, 171-194. Tucson, Arizona: The University of Arizona Press.
- Pinkerton, E. 1987. Intercepting the State: Dramatic Processes in the Assertion of Local Comanagement Rights. In *The Question of the Commons. The Culture and Ecology of Communal Resources*, eds. B. J. McCay and J. M. Acheson, 344-369. Tucson, Arizona: The University of Arizona Press.
- Richerson, P. J., R. Boyd, and B. Paciotti. 2002. An Evolutionary Theory of Commons Management. In *The Drama of the Commons*, ed. National Resource Council, 403-442. Washington, D.C.: National Academy Press.
- Rose, C. M. 2002. Common Property, Regulatory Property, and Environmental Protection: Comparing Community-Based Management to Tradable Environmental Allowances. In *The Drama of the Commons*, ed. National Resource Council, 233-257. Washington, D.C.: National Academy Press.
- Runge, C. F. 1986. Common Property and Collective Action in Economic Development. In *Proceedings of the Conference on Common Property Resource Management, Annapolis Maryland, April 21-26, 1985*, ed. National Research Council, 31-62. Washington, D.C.: National Academy Press.
- Sachs, J. 2005. *The End of Poverty. Economic Possibilities of Our Time*. New York: Penguin Group.
- Scoones, I. 1998. *Sustainable Rural Livelihoods: A Framework for Analysis* (No. 72). Sussex: IDS, University of Sussex.
- Steins, N. A. and V. M. Edwards. 1999. Platforms for Collective Action in Multiple-Use Common-Pool Resources. *Agriculture and Human Values*, 16(3):241-255.

- Stern, P. C., T. Dietz, N. Dolšak, E. Ostrom, and S. C. Stonich. 2002. Knowledge and Questions After 15 Years of Research. In *The Drama of the Commons*, ed. National Resource Council, 445-489. Washington, D.C.: National Academy Press.
- Stocks, A. 1987. Resource Management in an Amazon Varzea Lake Ecosystem: The Cocamilla Case. In *The Question of the Commons. The Culture and Ecology of Communal Resources*, eds. B. J. McCay and J. M. Acheson, 108-120. Tucson, Arizona: The University of Arizona Press.
- Taylor, L. 1987. 'The River Would Run Red with Blood': Community and Common Property in an Irish Fishing Community. In *The Question of the Commons. The Culture and Ecology of Communal Resources*, eds. B. J. McCay and J. M. Acheson, 290-310. Tucson, Arizona: The University of Arizona Press.
- Thomson, J. T., D. H. Feeny, and R. J. Oakerson. 1986. Institutional Dynamics: The Evolution and Dissolution of Common Property Resource Management. In *Proceedings of the Conference on Common Property Resource Management, Annapolis Maryland, April 21-26, 1985*, ed. National Research Council, 391-424. Washington, D.C.: National Academy Press.
- Tietenberg, T. H. 2002. The Tradable Permits Approach to Protecting the Commons: What Have We Learned? In *The Drama of the Commons*, ed. National Resource Council, 197-232. Washington, D.C.: National Academy Press.
- Townsend, R. and J. A. Wilson. 1987. An Economic View of the Tragedy of the Commons. In *The Question of the Commons. The Culture and Ecology of Communal Resources*, eds. B. J. McCay and J. M. Acheson, 311-326. Tucson, Arizona: The University of Arizona Press.
- Vondal, P. J. 1987. The Common Swamplands of Southeastern Borneo: Multiple Use, Management, and Conflict. In *The Question of the Commons. The Culture and Ecology of Communal Resources*, eds. B. J. McCay and J. M. Acheson, 231-249. Tucson, Arizona: The University of Arizona Press.
- Wade, R. 1986. Common Property Resource Management in South Indian Villages. In *Proceedings of the Conference on Common Property Resource Management, Annapolis Maryland, April 21-26, 1985*, ed. National Research Council, 231-258. Washington, D.C.: National Academy Press.
- Wade, R. 1988. *Village Republics. Economic Conditions for Collective Action in South India*. Cambridge: Cambridge University Press.
- Wilson, J. 2002. Scientific Uncertainty, Complex Systems, and the Design of Common-Pool Institutions. In *The Drama of the Commons*, ed. National Resource Council, 327-360. Washington, D.C.: National Academy Press.
- Wilson, J. 2007. Scale and Costs of Fishery Conservation. *International Journal of the Commons*, 1(1).
- Wittfogel, K. A. 1957. *Oriental Despotism. A Comparative Study of Total Power*. New Haven: Yale University Press.

- Wynne, S. 1986. Information Problems Involved in Partitioning the Commons for Cultivation in Botswana. In *Proceedings of the Conference on Common Property Resource Management, Annapolis Maryland, April 21-26, 1985*, ed. National Research Council, 359-390. Washington, D.C.: National Academy Press.
- Young, O. R. 2002. Institutional Interplay: The Environmental Consequences of Cross-Scale Interaction. In *The Drama of the Commons*, ed. National Resource Council, 263-292. Washington, D.C.: National Academy Press.