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Assessment of the Possibility of Integrating the Knowledge Bases of the Social Structure of Accumulation, Social Accounting Matrix, and the Social Fabric Matrix Approach to Analysis

by

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Abstract: The provisioning process is the result of economic functions being embedded in social institutions and social institutions being embedded in ecological systems. All three are united and unified to make deliveries to each other, in ways that are both beneficial and damaging. The purpose of this paper is to elaborate on the social fabric matrix approach (SFM-A), and to assess the possibility of integrating that approach with the knowledge bases of the social structure of accumulation and the social accounting matrix. The SFM-A to scientific analysis and policy evaluation allows for cultural values, social beliefs, institutions, attitudes, technology, and the ecological system to be assembled in order to articulate the transactional relationships among those components in order to discover the system network. The guiding goal is to work toward a more complete model for socioecological analysis and policy evaluation for modeling and planning for the provisioning process.

There is a society[1] and there is an ecological system. And they are united, in a manner by which one benefits and damages the other. And both are unified in all provisioning processes. Neither the current society nor ecological entities can exist without the other. They are embedded in each other, processing together. The set of societal relationships and transactions provides for goods and services, and, therefore, bads and disservices (because all provisioning produces bads and disservices). The components relevant to societal activities are cultural values, social beliefs, institutions, attitudes, technology, and ecological systems. All institutions include the influence of all of those components, so all provisioning of goods, services, bads, and disservices includes the processing of all those components. Production is the result of all those components processing together; therefore, nothing has ever been produced without the use and/or abuse of the ecological system. Provisioning takes place as a result of the working of institutions through which those six components and their elements are coordinated, although not necessarily in a manner consistent with the improvement of the general welfare. The social fabric matrix approach (SFM-A) to analysis provides a way to model, describe, explain, and analyze the coordination through deliveries among those six component sets (see Hayden 2006 and Natarajan, Elsner, and Fullwiler 2009).

Social scientists regularly state that the economy is embedded in societal systems. That description is sometimes made as if the economy is an entity separate from society that is then embedded as a separate set of institutions in society[2]. In such descriptions, the idea of "embedded" has been used as it was with the embedded media reporters who were added to military units when the United States invaded Iraq in 2003. Reporters were there and drew provisions from the units, but were not directly involved as a unified part of the units' combat mission. Since the idea of the economy as a separate entity is found in literature dealing with the

embedded economy, there is sometimes discussion of the economy becoming disembedded or unembedded because, logically, as a separate entity, it can function separately from society, just as reporters can function separately from soldiers. More correctly, economic processes are the parts of society that are united with other parts and identified by analysts as the economy. There is not an economy that exists as a separate functioning entity. Economic processes are the result of the unification of the components and elements of societal systems[3]. The concept of embeddedness is now recognized even in the popular media as is clear in John Kay's recent statement in the *Financial Times*: "We need to put out of our minds this widely held notion that there is such a thing as 'the economy', a monster outside the door that needs to be fed and propitiated and whose values conflict with things . . . that make our lives agreeable and worthwhile" (August 11, 2010).

Furthermore, ecological problems exist as a result of the social system being embedded in and united with the ecological system. In early human history, societal activities barely impacted on that system, but, as society changed technology and accumulated a larger and more powerful technological base, ecological systems—upon which provisioning is dependent—become more impacted, sometimes to the point of complete destruction of some of the systems.

Elaboration of the Digraph of the Social Fabric Matrix Approach

The purpose of this paper is to elaborate on the SFM-A, and to assess the possibility of integrating that approach with the knowledge bases of the social structure of accumulation and the social accounting matrix, given other contextual concerns. The elaboration is adumbrated with the digraph in Figure 1.

[Figure 1 about here]

Social beliefs, attitudes, technology, and the ecological system function together within social institutions in a society. They, along with cultural values, are expressed as separate parts in Figure 1 because of the extensive study that has been completed on each, not because they are separate from institutions in reality[4]. Delivery loops in Figure 1 that return to their own component are the first item for discussion. Those loops indicate delivery among the parts within each of the components.

The delivery loop among cultural values is included in Figure 1 with a note of caution. This author feels insecure about that loop because, in the literature reviewed about cultural values, nothing specific was found about whether and how different values might be related to other values. Delivery loops among component parts are indicated for social beliefs, attitudes, institutions, and ecological systems. However, with regard to social beliefs, it should be noted that when normative criteria (N_B) from social beliefs are adopted by institutions for a particular case, deliveries of social criteria and their elements (rules, regulations, requirements) are made by social institutions.

Ecological criteria (N_E) should not be interpreted to mean criteria designed so that judgments are made to protect the natural environment. Ecological criteria can be the opposite—they usually are. In modeling a system, the ecological criteria are criteria that exist in reality. For example, judgments are regularly made to dispose of toxic waste in a river, based on criteria about making profit.

There is no loop that indicates direct deliveries among technologies in Figure 1 because technologies do not make direct deliveries to each other. Technology is innovated, implemented,

and operated by institutions. The only delivery from technology is the delivery of normative criteria (N_T) to institutions that become required due to the adoption of technology by institutions. Technology, in turn, as indicated in both figures, is applied as a direct delivery by institutions to biological and physical ecological systems for extraction, destruction, and disposal. Implicit in the figures is the regular delivery of technology among institutions; for example, through sales, foreign aid, and systems of negative reciprocity. (Variant criteria $VarC_B$, $VarC_E$, and $VarC_T$ in Figure 1 are explained below.)

Following the advice of Richard Adkisson, the systems digraph of the SFM-A is enclosed in Figure 1 to indicate that the SFM-A system, like all systems, is open to its environment with inputs from and outputs to the environment as indicated at the bottom of Figure 1 (2009). This means that at least one row and column, or rows and columns, representing the system's environment should be included in the social fabric matrix (SFM) used to articulate the SFM-A.

Criteria, Rules, Regulations, and Requirements

Given the dominant importance of normative criteria and the rules, regulations, requirements, and attitudes activated by criteria, a brief review follows about those entities and the SFM. A general demonstration of the relationships among these entities is found in the SFM in Figure 2 and the SFM digraph of Figure 2 found in Figure 3.

[Figures 2 and 3 about here]

Relationships among Normative Criteria, Rules, Regulations, and Required Attitudes

Figure 2 demonstrates that the normative criteria of social belief norms (N_B), technological norms (N_T), and ecological norms (N_E) are considered together by authority institutions (I_{A1}) in order (1) to provide criteria elements, such as rules, laws, and court decisions, to other authority institutions (I_{A2}). The other authority institutions, in turn, formulate regulations for various institutions consistent with the rules, and deliver those regulations to processing institutions, for example, production institutions (I_P). The production institutions formulate requirements consistent with the regulations for persons working on production teams. These requirements are directives to persons about how they are to respond to different signs and symbols. These directives become personal attitudes and are expressed as responses to the signs and symbols by persons functioning in institutions, to include production institutions.

As stated above, the digraph for Figure 2 is found in Figure 3, with cell numbers and deliveries designated on the edges. Reading each row from left to right, the cell deliveries are expressed as directed edges between the components rows and columns. Cell (1,4) is the delivery of social belief criteria from social beliefs to authority institutions I_{A1}, cell (2,4) is the delivery of technological criteria from technology to authority institutions I_{A1}, and cell (3,4) is the delivery of ecological system criteria to authority institutions I_{A1}. I_{A1} uses those criteria to make judgments about the kind of rules to create. Cell (4,5) is the delivery of rules from authority institution I_{A1} to authority institutions I_{A2}. In turn, authority institutions I_{A2} formulate regulations that are delivered in cell (5,6) to processing institutions I_p. Then it is the task of I_p to design operating routines and procedures that require particular actions by persons in response to various signs and symbols in the production process. This delivery is in cell (6,7). These

directed requirements form personal attitudes (see Figure 2) that are then expressed as attitudinal responses in the processing institutions in cell (7,6). Requirement descriptions are broader than the directives to form personal attitudes, but requirements always include directives to persons if the work is to get done. (For a more complete explanation of Figures 2 and 3, see Hayden ([1998] 2009). This explanation, although simple, demonstrates that social provisioning cannot be understood without recognizing and accounting for normative criteria, rules, regulations, and attitude requirements. The failure of this recognition is one of the main reasons for the failure of economic models.

Ongoing Conflict

Three conflicts exist because of the structure and processes of normative criteria and their elements. First, there is conflict in a pluralistic society because different groups have different normative criteria. In the United States, for example, the Amish wheat farmers of Pennsylvania have different technological norms than other wheat farmers. Such differences can usually be accommodated in a society that respects pluralism, but it makes for conflict situations nonetheless. The conflicts are greater in societies where pluralism is not respected. Second, conflict is inherent among the normative criteria because of regular change, especially because of changes in technology. Technological change leads to a conflict between the old and new technological criteria, and between the new technological criteria and the established belief and ecological criteria. In a modern technological society, technological change is a regular occurrence; thus, constant conflict and adjustment are inherent. In a similar manner, new ideas can lead to new normative belief criteria which can lead to conflict with existing belief, technological, and ecological criteria. The same is the case when there is a change in ecological

criteria. Third, conflict happens when society is forced to live by criteria other than what is conceived to be normative criteria, as is the case with variant criteria.

Variant Criteria

Given the importance of normative criteria, one should not conclude that institutions are guided only by legitimate normative criteria that are consistent with what society believes to be appropriate—the community standards, so to speak. That is not the real-world case. Many criteria, rules, regulations, requirements, and attitudes that guide institutional and organizational operations are variant criteria, rules, regulations, and requirements. Although variations from normative ones, they are enforced to guide the working of institutional processes. They deviate from legitimate community standards, but are enforced in relevant societal settings. Some are not considered moral, but are legal. Some may be common practice without being stated in legal codes or court orders. Examples are practices of corporations when corporate campaign funds and lobbyists are used to establish variant laws and court decisions through legislative actions and court cases. Or they may be cases in which variant criteria are not legal, for example, the illegal abuse of workers in a factory setting. Variant criteria and rules with long-term application can be observed in an array of very different settings and spatial extension. One is when a farmer uses illegal pesticides. Another is when illegal aliens are hired by corporations. Still another is the imposition of neoliberal Western criteria and laws onto second- and third-world economies. Variant criteria are represented as $VarC_B$, $VarC_T$, $VarC_E$ in Figure 1. They can be added to Figures 2 and 3 both as variant criteria and the concomitant variant rules, regulations, requirements, and attitudes. Variant criteria need to be included in economic and policy analysis in order to know their effect on social, economic, and technological flows.

Variant criteria usually depend on power to override laws and community standards. Conflict is established in institutions between normative criteria and variant criteria—the greater the variance of variant criteria from societal norms, the greater the level of resources that must be expended to maintain them through propaganda, security personnel, workforce turnover, lobbying expenses, instruments of violence, and so forth. All modern societal institutions, whether market, Islamic, socialist, or other orientation have conflicts between normative criteria and variant criteria. This is the case with belief, ecological, and technological criteria. Since rapidly advancing technology leads societies to become more complex, hierarchical, and in a constant state of flux, there are more opportunities for various special interests to establish niches for variant criteria sets[5].

Contracts Establish Criteria

Much of rule-making, regulation, and requirement articulation to establish criteria is completed through contracts among different parties. Thus, contracts become very important in the fulfillment of policies and plans. Therefore, contracts, including those between so-called private parties, need to be evaluated with the assistance of the SFM[6]. A principle to remember for societal systems in general and for the articulation of a societal concern in a SFM is that rules, regulations, and requirements do not deliver themselves to institutional entities. Institutional organizations deliver rules, regulations, and requirements to other institutional organizations. When a contract is established, it means that normative and variant criteria rows in a SFM make deliveries to the SFM column cells of the parties of the contracts. Then the rows of the parties of the contract make deliveries of the terms of the contract to cells of the columns of the same parties. The contract specifies which parties have responsibilities for different parts

of the contract. In turn, the SFM rows of those parties make deliveries to the cells in the columns of other institutional organizations that are to carry out the responsibilities. (See Figures 2 and 3 for the sequence of different kinds of institutions involved in carrying out the rules, regulations, and requirements delivery in the SFM because of the negotiation of a contract.)

Attitudes and Knowledge

Knowledge as assigned, distributed, and used by persons in production organizations is part of the set of attitudes. Persons and groups acquire directives about the knowledgeable way to respond to social symbols; as examples, about how to respond to calculus derivatives that appear on the computer screens along a factory assembly line, and about how scientists are to respond to statistical techniques in scientific research. Knowledge and knowing come from institutional organizations and are used to make institutions work. Scott D. N. Cook and John S. Brown state that: "Knowing as an aspect of action can make use of bits of knowledge (in any of its forms) as tools. In doing so, the knowledge about the social and physical world 'disciplines' our interaction with the world . . . by interacting with it in a disciplined way. *Knowing is to interact with and honor the world using knowledge as a tool*" (Cook and Brown 1999, 389). (To honor by responding to the world's institutions is different than saying what is accomplished is honorable.) For the institutional world to function, workers at all levels need to know how to respond and react to signs and symbols correctly. Human action is *"*about what is *part of practice* as well as what is *possessed in the head"* (Cook and Brown 1999, 382). The practice is determined by institutions, so the knowledge and knowing are indirectly determined by normative and variant criteria through their rules and regulations. J. H. Powell and J. Swart

explain that it is a mistake to view knowledge as a stock-flow concept. According to the stock and flow view, "knowledge can be understood as 'stocks of things to be known' to which we add as we grow more knowing, like piles of sand to which we add grains" (2008, 1633). Such an idea is "at variance with the very reality of knowledge as a distributed property of an organizational system" (2008, 1633). Powell and Swat add that "knowledge simply does not behave as a 'stock and flow' property of a system and attempts to measure it based on such an assumption are ill-fated" (2008, 1663). Knowledge is applied with the use of technology by members that are organized in a social setting. "A condition for organizational members to undertake action is to be placed within a conceptual matrix woven by the organization." (Vladimirov 2001, 989). Firms, for example, create and weave different knowledge into their organizational matrix to make decisions about the kind of services to derive from their resources. "Such discretion stems from the fact that firms view, and thus utilize, their resources differently. On this view, organizational knowledge is the set of collective understandings embedded in a firm, which enable it to put its resources to particular uses . . . *–it is a distinctive way of thinking and acting in the world"* (Vladimirov 2001, 981).

The place of knowledge in production is crucial for the success of planning and policymaking for programs. For programs to be successful, knowledge about how to apply and operate consistent with the social, technological, and ecological criteria is essential. For example, macroeconomic expenditure programs should impart knowledge to managers and workers about how to protect the environment, maintain the technology and infrastructure, and protect workers from production-related diseases.

Consistent with the SFM-A, directives are delivered by institutions to form different attitudes and knowledge in order to call forth responses and knowing activities. If groups have the wrong attitudes and knowledge, the response will be wrong, thereby engendering institutional failure. An example is presented in the SFM study of the Nebraska school aid distribution formula completed by this author. In Figure 4, the authority institution Nebraska Department of Education (in row 12) delivers directives to processing institutions (in columns 9 and 14 through 40) about the data to collect or use, the formula calculations to make with the data, and instructions about where to deliver the calculations after completion. Particular knowledge and knowing are necessary to complete these tasks. Upon receipt of the directives and the application of knowledge by the institutional groups, those groups, in turn, become row entries to deliver their findings to other appropriate institutions (Hayden 2009, 212-213).

Whenever rules, regulations, and requirements are delivered to the columnar cell of an institution, that institution must become a row entry in the study or the process ends with that cell. For example, if a corporate headquarters sends a corporate regulation to a production subsidiary that obligates the subsidiary to dump toxic waste into a nearby river, the study cannot demonstrate the dumping into the river in a SFM unless the subsidiary is made a row entry with the waste delivered to the cell of the column representing the river. Most economic studies leave out the latter step because of the narrow interest in the production of goods and services, without concern for criteria antecedents and consequences.

Context is the Enemy of a Basic Ideological Component of Macroeconomics

Real-world context and the many measures of that context have led to an obvious growing credibility chasm between reality and economic models, to include macroeconomic models. We

have been, and continue to be, in an intense period of degradation, depletion, depreciation, deterioration, decompression, destruction, deindustrialization, and deaccumulation[7]. Those deleterious processes are a unified part of production that are generally neither discussed nor measured in macroeconomics because the analysis of macroeconomics has been organized so that the economy is defined as an entity that is disembedded from its social and ecological context[8].

"Context is the enemy of gullibility" (Byrd 2008, 126). The more knowledgeable policymakers are about real-world contexts, the less likely they will be misled by ideology. The reality of the current context is clarified with numerous progress indicators that have been constructed in the last few decades at the community, city, state, regional, and national levels. Various different kinds of genuine progress indexes demonstrate that the trend of general welfare has been downward for decades while the trend for GDP has been upward for the same period[9]. These indexes are readily available, yet economists continue to describe United States history with terms such as growth, development, and accumulation. For example, the social structure of accumulation literature has been devoted to the relationship between the structure of institutions and economic accumulation, when in fact it has been a time of deaccumulation.

The reason economists continue to act as if economic welfare is growing in the face of the overwhelming evidence to the contrary appears to be because there is an ideological set of concepts that cut across other different ideologies[10]. Two examples are as follows: First, N. Gregory Mankiw, in his *Macroeconomics*, states that: "Of all the measures of economic performance . . . the one that best measures economic wellbeing is GDP. Real GDP measures the economy's total output of goods and services and, therefore, a country's ability to satisfy the

needs and desires of its citizens" (2010, p. 568). The ecology is not even mentioned in Mankiw's book, and there is no mention of the positive relationship between GDP and disease, resource waste, and ecological destruction. Second, James K. Galbraith, in an exchange with Paul Krugman about more government spending to stimulate employment, stated that "government spending should not be considered 'costly'. Done correctly, in economic terms it amounts simply to the reduction of the waste that is associated with unemployment" (2010). Again, the ecology is not considered in that statement, nor is the positive relationship between GDP and disease and waste. Production creates numerous kinds of waste. Unemployment may be less costly, but it may not; that depends on how much damage is being done by the employment. Although these economists hold different ideological positions, they both hold to the idea that the narrow measure of GDP indicates—ignoring evidence to the contrary—an increase in economic wellbeing. Thus, both Mankiw and Galbraith support policies and activities to increase employment and production.

In that simple yet powerful ideology, there is no recognition of the importance to consult belief criteria to determine if the production and employment are socially legitimate or to recognize ecological system destruction that accompanies employment and production[11]. "'In order to ascertain the meaning of an intellectual conception,' writes Pierce (1931-1958, Vol 5, para. 9) 'one should consider what practical consequences might conceivably result from the truth of that conception; and the sum of these consequences will constitute the entire meaning of the conception.' The point is that the pragmatists believed that the 'truth' of a statement can be tested adequately only by the consequences of adopting the assertion . . . ." (Verma and Churchman 1997, 671). Most macroeconomists adopt the intellectual conception of

macroeconomics and its production and employment policies without respect to many of its consequences.

Relating the Social Fabric Matrix to Social Structure of Accumulation and Social Accounting Matrix

To move beyond the narrow approach, such as has been mentioned with regard to macroeconomics, we know it is necessary to turn to the analysis of whole systems. This has led to various different models and tools for policy analysis. They include the Action Impact Matrix, Sustainable Development Assessment, System Dynamics, Social Fabric Matrix, Social Structure of Accumulation, and the Social Accounting Matrix. This paper discusses the latter two in conjunction with the SFM.

Relating the Social Fabric Matrix to the Social Structure of Accumulation

The social structure of accumulation (SSA), as an approach to analysis, is most concerned with the explanation of the relationships between institutions and historical periods rather than with designing plans or policies. However, its concern for the long period is consistent with the concerns of planning and policymaking. SSA is consistent with the SFM-A by being concerned with institutions broadly to include economic, political, financial, government, religious, and educational institutions, and with the integration of institutions (see McDonough, Reich, and Kotz 2010). The SFM-A (to include the SFM) would serve SSA well for those concerns. SSA has also been concerned with normative criteria, especially social beliefs as expressed through ideological analysis. The SFM-A would serve SSA well to further refine the definition of social belief criteria in particular cases and to refine the relationship between belief criteria and

institutions. In addition, the SFM-A would allow for normative technological and ecological criteria to be added to the explanation of the social structure. Additionally, the integration of institutions in the SFM would help solve the problem of the "lack of specificity about the exact character of SSAs themselves" (McDonough 1994, 74). Furthermore, the use of the SFM-A for the analysis of institutions and normative criteria would provide a framework for social indicators in general and for genuine progress indicators in particular in order to measure accumulation and stagnation.

To this author's knowledge, the SFM-A has not been utilized to model change for long-term periods but it has been for shorter periods to describe and analyze change within a process (Hayden and Bolduc 2000, Hayden 2009), and there is an explanation of how to model longer periods of successional time and evolutionary time in Hayden (2006, 178-181). Such use of the SFM would allow for the construction of the SSA in a way to mark points and dates of expansion and stagnation.

The SFM can be used to model change and evolution by monitoring deliveries among the components and elements of the matrix. Through such monitoring, it is possible to observe changes in levels of deliveries that lead to cumulative changes in the components. The delivery changes can be from the components in the SFM system, from the system's environment, and/or from new components that have developed. Illustrations are found in Figures 6 and 7. Figure 6 represents a SFM digraph of components 1 through 10 from a SFM. They are organized in three overlapping processes, the overlaps being the result of deliveries between components. System changes can be observed in Figure 7. Figure 7 illustrates a system that has become more complex, has developed new components and deliveries, and has lost particular components and

deliveries. A well-monitored SFM allows for the observation of such changes. Victor Lippit explains such changes from the work of Martin Wolfson. Lippit explains that Wolfson argues "that 'the financial component of the postwar social structure of accumulation contributed to strong economic growth in the United States . . . .' Wolfson places special emphasis on the financial reforms of the 1930s . . ." (2010, 51). Changes came about as "many of these reforms were reversed in the 1980s and 1990s . . ." (2010, 51). The details of such changes in financial institutions and the normative criteria expressed through rule changes can be modeled and monitored with the SFM (see Scott Fullwiler 2009). Such information would be very useful to planners, as they could observe the buildup or decrease of deliveries among components that can forecast system changes.

Relating the Social Fabric Matrix to the Social Accounting Matrix

The social accounting matrix (SAM) is the most technically refined of the approaches being considered here, has been applied more extensively, and is generally consistent with the SFM-A in that a basic concern of both is with regard to deliveries among the various sectors included in their respective matrices. To integrate SAM into the SFM-A will make for the kind of planning, policymaking, and monitoring paradigm now needed. Such integration will lead to the inclusion of normative criteria, rules, attitudes, social institutions, ecological entities, and progress indicators not included in SAM today.

The SFM was developed "to allow the convergence and integration of conceptual works in instrumental philosophy, general systems analysis, Boolean algebra, social system analysis, ecology, policy analysis, and geobased data systems' (Hayden 2006). It allows multiple forms of data to be incorporated into one analytical tool. While not comprehensive, it identifies and

incorporates six main components in examining a problem and in attempting to develop a policy to solve the problem" (Sturgeon 2009, 42). The six components were outlined above.

> Each component is analyzed with an eye toward determining the flow and delivery of one component to another. By conducting the analysis in this manner, the SFM can 'express the attributes of the parts as well as the integrated process of the whole' (Hayden 2006).
>
> There are seven major characteristics of the SFM itself: (1) it is based on the concept of delivery, (2) rows deliver to the columns, (3) it is a noncommon-denominator matrix (meaning that all kinds of data can be incorporated), (4) cell observations are the flows of the system (that is a 1 in a cell represents a direct delivery; therefore, indirect deliveries are not counted (in a cell), (5) the number of cells is dependent on the study at hand, (6) the matrix defines the system as it exists, and (7) the matrix allows for model building and data collecting consistent with theory' (Hayden 2006) (Sturgeon 2009, 42).

SAM, as currently constructed, is consistent with some SFM characteristics and inconsistent with others. Generally, when inconsistent, as now constructed, SAM can be made consistent by being integrated into the SFM. First, SAM and SFM share the basic input/output matrix. Second, although SAM is narrowly defined to be based only on monetary expenditures, a SAM can be incorporated into a SFM to take advantage of the latter's multiple forms of data resulting from the components that are included. Third, the problems of interest to SAM users can be extended to fit normal policy concerns if SAM is fitted into a SFM. Fourth, both SAM and SFM are based on the concept of delivery. Fifth, SAM is a common denominator matrix;

thus, it needs to be integrated into a SFM to determine the relationships between expenditures and deliveries of other important components of the system for which there is not common denominator. Sixth, SAM does not attempt to define and explain the system that is creating the problem of interest. Seventh, the integration of SAM and SFM will allow for model building and data collection consistent with transdisciplinary systems theory and socioecological systems.

What is included in a SAM varies with different conceptual presentations and applications so all discussion that follows does not apply to all SAM studies, but is generally relevant. One difference among different SAMs is what is included in the rows and columns of the matrix. Although very different kinds of entries are made in the rows and columns, they are treated as if they have the same character of deliveries. An example is when business institutions, investment, and wages are each entered in a SAM as different rows and columns, and are all treated as institutions making monetary expenditure deliveries. Investment is not an institution and it does not make direct monetary deliveries. Investment is plant and equipment, and it is usually delivered by institutions such as corporations and government agencies to other corporations and government agencies. Wages are a delivery from corporations, government agencies, nonprofits, religious organizations, universities, and so forth made to households and families.

The basic information in a SAM is usually presented as (1) having rows and columns always directly exchanging deliveries with each other so that if row A delivers to column B then row B will also make a delivery to column A, and (2) having each cell containing only one kind of delivery. These assumptions do not hold in real-world processes so SAMs are insufficient for planning as traditionally constructed. This set of methodological assumptions and characteristics

of a SAM is consistent with the assumption that the economy in general, and markets in particular, are disembedded, and therefore ignores the complex web of social and ecological relations that can be included if a SAM is embedded in a SFM.

A real-world SAM in a SFM will not necessarily have institutions making direct exchange of deliveries with each other. For example, social beliefs deliver criteria directly to corporations without receiving a return delivery. The same is the case for other normative criteria. In a similar manner, a corporation may deliver unwanted pollution to another corporation without a return delivery. The same is the case when a corporation delivers cancer to households or toxic waste to a river. There usually is no return delivery in the opposite direction, from households or river to the corporation.

A problem in much of economics that has already received serious attention in numerous publications is the assumption that it is possible to have a common denominator in complex systems. Beyond that general assumption, a more serious mistake is that commercial prices could possibly serve as a common denominator. The SFM-A explicitly rejects any endorsement of a common denominator, and thus, the SAM can be expanded to do the same. Thus, it is not possible to add all the entries is a row or column—pollution, cancer, and monetary payments mall al be in the same row or column. When undertaking macro or system planning, it is unlikely that many of the cells used to define real-world deliveries would all be the same kind. The same corporation, for example, may deliver investment goods, consulting services, consumer goods, government rules, and pollution in the same cell to another corporation. A different corporation will, during the same period, make a different set of deliveries to the same receiving corporation. Relevant research needs to take account of all these different deliveries in order to calculate

relationships among them. This is important, for example, in determining what industries macroeconomic stimulus funds should be diverted from in order to protect the environment or prevent cancer. This became a real issue in the United States last year between some state governors and the Obama Administration. Governors were demanding that stimulus funds be released without respect to the environmental damage that would be caused by particular projects in their respective states. The Obama Administration appropriately withheld the funds until being assured that production operations and technologies were changed in order to protect the environment.

SAM has been constructed in some cases so that monetary expenditures are divided according to the amount of money received by different industries (see Graham Pyatt and Jeffery I. Round l985). Pollution studies have also documented the amount of pollution from different industries. These two kinds of studies provide two sets of deliveries that can be related in a SFM, along with policies to adjust production to low-pollution industries. Additionally, needed changes in laws (often to change variant criteria and laws) for particular industries can be identified.

In a like manner, SAM has been constructed to measure the distribution of income by looking at the amount of wage expenditures going to different kinds of households from different industries (see Pyatt and Round 1985). With the benefit of that information, a SFM can identify what kinds of wage rules or regulations need to be changed to impact on the wages paid by low-income industries.

Any real-world problem of interest is embedded in an array of different institutions along with concomitant criteria, rules, technologies, and ecological entities of those institutions. For

economic planning to be relevant, these entities should all be included in the matrix. For example, if the concern of interest is hospital care, institutional roles are played by environmental protection advocates and agencies, orders of nuns, corporations, government agencies, research universities, labor unions, banks, insurance corporations, nurses' training organizations, and so forth. All those institutions are involved in the production and delivery of the goods, bads, services, and disservices associated with hospital care. Without a means to understand their relationships and determine which deliveries make a positive contribution and which deliveries make a negative one, it is unlikely that we can be successful in providing an efficient system of hospital care. Bad deliveries need to be included in the matrix along with the criteria, rules, and regulations that allow for and obligate the production and distribution of bads.

Macroeconomists are rightly concerned about multipliers, as monetary expenditures are multiplied through different societal institutions in response to expenditure changes. For planning purposes, it is also necessary to define the relationships between expenditure multipliers and other multipliers. As production, employment, and inflation levels change, the impact of those changes filter through society and change institutions. The physical infrastructure will change as homes and buildings are destroyed through "urban renewal" in cities and home abandonment in rural areas and small towns. Additionally, impacts will be multiplied through the ecological system. Production generates (1) direct ecological damage on the resource input side through habitat degradation and loss of species, (2) direct ecological damage from the output side through pollution, and (3) indirect ecological damage as the consequences of habitat degradation and pollution impact on each other. Mohan Muniasingh and Wilfrido Cruz outline some of these impacts in an action impact matrix (AIM) (Muniasingh

and Cruz 1994 and Munasingh 2010, 155-158). However, an AIM is not an interactive matrix but a table that summarizes impacts. It does not assist in discovering relationships and calculating impacts. The purpose of the SFM and SAM should be to discover relationships among components and calculate impacts that are the consequence of changes in deliveries. The SAM integrated into a SFM would be able to define the relationships between changes in monetary expenditures and changes in social and ecological components and their deliveries.

The main difference between the multiplier effects of expenditure streams in macroeconomics and multiple ecological effects in ecological systems is that ecologists do not suggest that we collapse ecological deliveries into a common denominator. Ecological effects are different in origin, kind, level of delivery, and long-term impact. The same kind of differences exist for monetary expenditures, but they are hidden with the assumed common denominator of money used to hide the differences. A common denominator can be assumed if the only interest is how fast dollars turn over through the system. However, we know the meaning and consequences of the dollar expenditures are not the same when spent on crop production cultivation that protects the soil as when spent on crop production cultivation that destroys the soil. Such differences can be researched and recognized in a SAM/SFM approach that will make it possible for economic planning to be successful.

Conclusion

The conclusion reached in the discussion about the possibility of integrating the concepts from the SFM, SSA, and SAM is that such integration is not only possible but necessary in order to provide for the kind of analysis needed for understanding, planning, and policymaking. It is necessary in the context of what this paper outlines as important for such an endeavor to be

successful. The context includes: (1) A recognition that holistic theory of socioecological systems, similar to that displayed in Figure 1, is necessary; (2) the six components of cultural values, social beliefs, institutions, personal attitudes, technology and ecological systems need to be integrated because they are embedded together to provide for the provisioning process; (3) the six components are guided and held together by normative and illegitimate variant criteria, thus, both need to be included in modeling and analysis; (4) criteria in conjunction with advancing technology and new ideas establish a constant stream of new societal conflicts that need to be monitored and addressed in policymaking; and (5) we need to move beyond the idea that fate will bring progress and enhance welfare if we just undertake production.

Notes

1. The sociologist Nicole Biggart, during a Karl Polanyi symposium about embeddedness, stated that economists often begin talks with the remark, "assume a market." They do not mean a real market, but, rather, a fictional construct that includes additional assumptions like perfect information, independent firms and actors, homogenous products, rational actors with complete information, the existence of utility and its maximization by actors, and equilibrium. Biggart wondered what it would be like if, in response, sociologists opened with "assume a society" (Krippner, Granovetter, Block, Biggart, et al. 20045, 119).

2. See discussion in Krippner, Granovetter, Block, Biggart, et al. (2004).

3. Thus, as John Dewey emphasized, analysts need to identify the problem of interest before they can know what to study. That study can be called economic if it is

understood that what is considered economic will change with the identification of each different problem. This means that to assume that any particular problem is to be solved with either microeconomics or macroeconomics does not follow, because real-world problems include both detailed activities within institutions and transactional aspects across various system components.

4. For a more complete description of the six components, see Hayden (2006, 75-85).

5. It may be the case that the more important variant criteria become in a system, the more protean the variant guidelines because of the constant pressure and conflict within the institutions and constant battles in legislative bodies and courts to change the variant criteria that are seen as being illegitimate.

6. For an example, see F. Gregory Hayden and Steven R. Bolduc (2000).

7. Some specific examples of those processes in the United States are as follows: mountains destroyed to get coal; coal burned that creates climate change; water systems disrupted; water resources destroyed; water quality diminished; soil denuded, eroded, and its nutrients depleted; use of pesticides that cause extinction of species and industries; huge rural regions and urban neighborhoods depopulated; disintegration of families; urban sprawl; buildings depreciated by air pollution; wages, incomes, and wealth decompressed; pension funds underfunded and raided; deterioration of the physical infrastructure of bridges, dams, streets, highways, railroad service and pipelines; ethanol produced for fuel; donut production; arms production for export; website universities; disappearance of knowledge bases and skills; manufacturing industries downsized;

energy resources depleted, depreciated, and wasted; leaking toxic waste disposal sites; the Katrina flood; antibiotic overuse, and so forth. This list could be continued to book length.

8. Our goal should be to follow the precautionary principle, which means to avoid approving production activity until it is possible to document its safety through system modeling and studies of the relevant socioecological context.

9. *The Index of Social Health of the United States* is based on 16 indicators. They are infant mortality, child poverty, child abuse, teenage suicide, teenage drug abuse, high school dropouts, unemployment, weekly wages, health insurance coverage, poverty among the elderly, out-of-pocket health costs among the elderly, homicides, alcohol-related traffic fatalities, food stamp coverage, access to affordable housing, and income inequality. In 2008, the Index was 55.5 out of a possible 100. "Overall, between 1970 and 2008, the Index declined from 66.2 to 55.5, a drop of 16 percent" (Institute for Innovations in Social Policy 2010, 1-2).

10. The idea that it is best to take action without respect to consequences seems to be a traditional trait of Western society. More than once, corporate executives have appeared before a public commission or committee on which this author was a member and testified, in response to questions about some ill-conceived action, to the effect that, "I would rather do something wrong than do nothing at all." George Bernard Shaw is purported to have advised: "A life spent making mistakes is not only more honorable but more useful than a life spent doing nothing." Worse advice is rarely stated. It makes the life of Vice-President Dick Cheney appear very honorable. The illusion that taking

action, without respect to whether it is a mistake, will lead to progress appears to be consistent with the Western "Idea of Progress" which Robert W. Merry explains as the belief that progress is inevitable and inexorable. (2005, 39-44) It is "a fundamental reality of current Western thinking—namely that the Idea of Progress remains for many the central underlying philosophical precept and the wellspring for much of what we see today in the way of perceptions, outlooks, predictions, and convictions." (Merry 2005, 41). Consistent with the idea that progress is fated, macroeconomists adopted GDP as an indicator for progress that they knew was inevitable. The long term rise of GDP need not be questioned because it is consistent with the idea of the inevitability of progress.

11. There are examples to the contrary. A source of contrary literature that is also a good source for references is *Twenty-First Century Macroeconomics: Responding to Climate Change,* edited by Jonathan M. Harris and Neva R. Goodwin (2009.

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