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## Siegfried Von Ciriacy-Wantrup and His Safe Minimum Standard of Conservation

S. V. Ciriacy-Wantrup contributed many important concepts in resource economics and policy. Perhaps Wantrup's most enduring concept, from his major work, *Resource Conservation, Economics and Policies* (1952), is his "safe minimum standard of conservation." Extended by Richard C. Bishop and others, Wantrup's safe minimum standard provides the economic rationale for biodiversity conservation worldwide.

Long before public attention focused on the need to conserve biodiversity, Wantrup insisted that flow resources (such as soil, water, plants, and animals) should not be allowed to decline below a safe minimum standard of conservation lest the decline become economically irreversible. Wantrup observed, for example: "with the destruction of the breeding stock or, frequently, its natural habitat, flow becomes economically (and technologically) irreversible." Irreversible loss of flow resources can permanently eliminate species and cause civilizations to decline. Wantrup first addressed irreversibility, or "permanency of destructive exploitation," as early as 1938 in a journal article titled "Economic Aspects of Land Conservation."

The primary objective of conservation policy, Wantrup urged, must be to maintain a safe minimum standard of conservation, to be determined for each flow resource. In Wantrup's view, maintaining this standard is achieved by avoiding "those physical conditions, brought about by human action, which would make it uneconomical to halt

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and reverse depletion." Wantrup argued that a safe minimum standard of conservation should be "the base level for international action." He asserted that "Conservation of flow resources—in particular, realization of a safe minimum standard—benefits many nations and harms none."

Under conditions of risk and uncertainty, a safe minimum standard of conservation is more readily attainable than optimum conservation. Conservation decision making thus becomes step-by-step change, above the safe minimum standard, in the direction of optimum conservation. The safe minimum standard of conservation applies in all situations except when the social costs of its application are unacceptably large.

### Influences upon Wantrup's thought

Wantrup came into resource conservation, including his safe minimum standard of conservation, more by way of German theories of soil conservation integral to farm management than by American theories of land economics. He found the latter inadequate in important respects, and in reviewing Richard T. Ely's and George S. Wehrwein's classic *Land Economics* in 1940 he observed: "Their treatment in connection with individual kinds of land makes repetitions and omissions almost unavoidable and gives less focus to the general theoretical analysis of principal issues. Excellent paragraphs on conservation, for instance, can be found in most of the last nine chapters but the economic and social contours of the conservation problem as a whole do not appear clearly."

The Ely/Wehrwein textbook was state-of-the-art at the time, but as no book is ever all-inclusive or the final word on the subject, neither was theirs. Wantrup was thinking and beginning to write about the economics and policies of resource conservation himself, and he knew there was far more work to be accomplished on the subject. Wehrwein, in an article published a year later, conceded as much when he wrote: "there is as yet no complete body of theory setting forth in a systematic fashion the 'principles' of land economics... One of the tasks in the near future is the synthesizing of land economics, which is at once price and institutional,

into a rounded body of theory." Theoretical economic analysis of resource conservation issues became Wantrup's singular career task.

To gain perspective on Wantrup's approach to the economics and policies of resource conservation, it is essential to understand his German upbringing, academic training, and the influences of German conservationists. The German word *konserven* literally refers to tinned (canned) food, prepared and kept safe for eventual use. Wantrup understood resource conservation as the *when* of resource use, rather than implying no use whatsoever. In *Resource Conservation*, he writes: "In conservation, the redistribution of use is in the direction of the future; in depletion, in the direction of the present."

Born in Germany in 1906, Wantrup first learned about resource conservation while spending boyhood summers on his grandfather's farm. Ultimately, the thought and work of Johann Heinrich von Thunen, extended by Friedrich Aereboe and Theodor Brinkmann, much influenced him. Wantrup regarded Thunen, who emphasized enterprise diversification to maintain soil fertility, as "the father of scientific farm management" and particularly "for the thinking about land conservation."

Germans considered soil conservation essential to sound farm management, while Americans practiced soil depletion. Wantrup writes:

Soil conservation in Europe was brought about through a relative technical and institutional land scarcity and through a conservative mental attitude towards the land long before the economic stage was reached at which soil conservation was economically possible in a free competitive society. A technical and institutional scarcity of land virtually did not exist when the North American continent was opened to European settlement.... Under these circum-

stances, soil depletion was an economic necessity.

Around the turn of the century, German economic geographer Ernst Friedrich popularized the word *raubwirtschaft*, literally meaning plunder economy, to describe the unwise destructive exploitation of land.

Such influences began to take hold of Wantrup when he attended the universities of Berlin, Vienna, and Bonn,



receiving his undergraduate degree at Bonn in 1928. Aereboe taught at Berlin and Brinkmann at Bonn when Wantrup was a student. Max Sering, the German expert on agricultural policy and land tenure, also taught at Berlin at that time.

Wantrup spent a year in graduate study at Berlin in 1929, then came to the United States as an international exchange student and completed his master's degree at the University of Illinois in 1930. When Wantrup studied at Illinois, H. C. M. Case (farm

organization and management) and Charles L. Stewart (agricultural policy and land tenure) taught there and were among America's leading professors in their fields. While at Illinois working on his master's thesis, studying size of farms in relation to farm organization and farm earnings, Wantrup also compiled data that became the basis of his doctoral research. He obtained his doctor of agriculture degree at Bonn in 1931 with a dissertation on the optimum size of farms in the United States with special reference to the Corn Belt. This dissertation was published the next year and brought him considerable recognition in the United States.

From 1932 to 1936 Wantrup worked as a privat-docent (lecturer) and research associate affiliated with the Institute for Social and Economic Sciences at the University of Bonn. He became increasingly disaffected with Nazi Germany and obtained a Rockefeller Fellowship to travel and conduct research from 1935 to 1937. His study of U.S. land use and conservation policies brought him to the attention of the Giannini Foundation of the University of California, where, in 1938, he was appointed assistant professor. He stayed on at the University of California, ultimately becoming a U.S. citizen, and was promoted to associate professor in 1939 and full professor in 1946.

Upon Wantrup's employment by the University of California, the Agricultural Experiment Station initiated a long-term research project in resource conservation issues and Wantrup immersed himself in the economics and policies of American resource conservation. Among American conservationists who influenced Wantrup, nineteenth century geographer George Perkins Marsh stands out. In reviewing Ely's and Wehrwein's *Land Economics*, Wantrup acknowledged their tribute to Marsh and added that Marsh "is far too little known among economists in spite of

the fact that he presented in 1864 the physical reasons for social action in the field of land conservation in almost classical fashion.”

While continuing to work on the economics of farm management, Wantrup by 1942 was focusing more of his attention on the private and social economics of resource conservation. As he became increasingly knowledgeable and influential about American resource conditions and needs, he was not reluctant to disagree with resource development proposals. Marion Clawson, in his autobiography, recalls that he and Wantrup sparked a controversy in the 1940s when they opposed the recommended allocation of costs for water resource development in the Central Valley of California. They objected to what they felt was a blatant loading of project costs onto the general public as a subsidy to irrigators, and their dissents are part of the official record. Clawson felt that the committee's work was biased and its results unacceptable. He and Wendell Calhoun bluntly denounced the cost allocation as “neither equitable nor in the public interest,” (Clawson and Calhoun spoke for the Bureau of Agricultural Economics of USDA). Wantrup contended that the cost allocation would “prejudice the optimum economic development of California's resources, including agriculture, and may even adversely affect repayment of project costs to the United States Government.”

This was among the learning experiences that became a basis for Wantrup's later writings on the costs of western water policies, benefit-cost analysis, and investment in public resource development. He was among the earliest economists to address “quality of life” issues in planning for resource development. He saw the interaction of qualitative and quantitative elements as the central issue in resource analysis, and he argued “the mere necessity of quantifying makes benefit-cost analysis worthwhile because of its stimulating effects in expanding scientific understanding of the physical as well as social problems involved in public resource development.”

### Resource conservation—and Wantrup's legacies

As Wantrup worked toward his general theory of resource conservation, he published a steady stream of illuminating articles that eventually formed the core of his book. His articles contained acute insights into economic aspects of land conservation, most especially his recognition in the late 1930s of the specific content of social costs and the urgent need for improved social cost accounting. He was the first economist to directly apply joint-production theory to forestry (multiple and optimum use). He examined the roles of private enterprise and taxation in resource conservation. International cooperation in conservation policy, which today centers on biodiversity conservation, was a topic of

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Wantrup's writings as early as 1945. Also, in the late 1940s, he was the first to suggest studies of contingent valuation (willingness to pay for gain or to accept compensation for loss).

In 1952 the University of California Press published Wantrup's much-awaited *Resource Conservation* (second and third editions followed in 1963 and 1968), a logical and carefully written synthesis of economic principles important to the conservation of natural resources. He examined the effects of interest rates, time preferences, income, taxes, prices and price supports, market form, economic instability, prop-

erty, tenancy, credit, irrationality, extra-market values, uncertainty, and habit patterns on resource use and conservation.

Fluent in German, English, and French, Wantrup made perceptive use of relevant literature in all three languages. For instance, he cites the thinking of Jules Dupuit (a nineteenth century French engineer-economist) in connection with optimum conservation. Dupuit's contributions to spatial economics and optimal resource allocation were largely overlooked by economists until the mid 1980s.

Wantrup's book addressed many difficult concepts. These concepts were not always easy for even economists to grasp, and Wantrup encouraged noneconomists to skip some portions of the book. Yet, for those readers who were analytically capable and who persevered, *Resource Conservation* opened exciting new avenues of understanding and inquiry. Fortunately for other readers, the California Agricultural Experiment Station wisely published an abridged version of the book, a forty-page circular titled *Dollars and Sense in Conservation*.

Wantrup discusses conservation policy at length, especially the potential of social institutions to be either obstacles or aids to resource conservation. He does not treat institutions as constant or given, but rather as changeable: institutions are variables that both affect and are affected by decision making about resources. In line with Ely and Wehrwein on this foundational truth, Wantrup held that proper institutional development is the key to resource management. Resource institutions are so central to his theories that he wrote: “Natural resource economics is analytically oriented institutional economics.”

Wantrup eventually presented a theory of hierarchical decision systems, where each successively higher decision level adds to the institutional framework. Households, firms, and other organizations are influenced by professional resource managers, who in turn are influenced by the legislative, executive, and judicial branches of govern-

ment. Wantrup urged study of the structure, functioning, and performance of institutional systems as the first step toward their modification.

Wantrup gave increasing attention to water, marine, and coastal resource conservation, and he offered penetrating insights into the increasing concern about common-property resources (those where more than one resource user has physical and legal access to a resource). Common-property resources often are "fugitive" resources, such as fish, that must be captured to be used. Again he showed that proper institutional development is the key to resource management, as he observed:

The notion that the common-property character of resources is the main cause of environmental depletion has spread recently from the fisheries to other fields of resource use and has been termed "the tragedy of the commons." This catchy phrase has created much confusion...

Common property of natural resources in itself is no more a tragedy in terms of environmental depletion than private property. It all depends on what social institutions...are guiding resource use in either case.

Wantrup illustrated his views with examples of effective social institutions to conserve common-property resources such as public forests, game and fish, and even agricultural lands that in some cultures are held as common property. He rejected the notion that private property rights in resources automatically prevent serious depletion. He and Bishop argued that some optimism is warranted "in view of the durability of the common property concept and the viability and social performance of the institutions that make it functional." The correlative rights doctrine regarding groundwater, the public trust doctrine as it applies to both land and water, and fishing quotas are workable approaches to solving problems of com-

mon-property resources.

Truly one of the great resource economists of this century, Wantrup brought much greater clarity to analyzing the conservation dilemma and the means to resolve it. Wantrup also was noted for his effectiveness as a teacher of graduate students and supervisor of doctoral research. After retiring with emeritus status in 1973, he continued to supervise doctoral programs of graduate students at the University of California. He died in 1980, leaving two invaluable legacies: his ever-relevant safe minimum standard of conservation, to guide future stewards of the Earth; and his theoretical framework for study of the economics and policies of resource conservation, to guide generations of fellow economists. ■

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