Land Use Law (II): Florida Is a Major Testing Ground

The first of these articles on land use law, appearing in the 16 November issue of Science, *described the proposed national land use policy legislation and its origins in widespread abuse and misuse of land. The writer, Luther J. Carter, a member of the* Science *news staff, is completing a study of land use policy in Florida for Resources for the Future, Inc.*

Enactment of the land use policy legislation now pending in Congress, which seems near, will present a major challenge to state government. The states will be expected to recapture some of the land use control authority previously delegated to local government and to prescribe regulations in this field. A number of states already have such programs, but these vary enormously in nature and scope, going from Hawaii's program of comprehensive statewide zoning (no other state has taken so broad an approach) to California's program of coastal zone conservation.

The proposed Land Use Policy and Planning Act of 1973 was passed by the Senate in June and is now undergoing final "mark-up" in the House Interior Committee in a different but essentially similar version. Generally speaking, the states would have to enact major new legislation to meet the proposed federal act's requirements. In the case of Florida, however, this state's Environmental Land and Water Management Act of 1972 anticipates nearly all those requirements.

For that reason alone, any experience bearing on the potential effectiveness of Florida's new law can be significant from a national standpoint, especially since a fully adequate legislative response to land use problems is still probably some years away and is likely to come only in evolutionary fashion, with many fits and starts. Yet Florida is an unusually important testing ground for land use policy for other reasons as well. In this connection, several things must be pointed out:

- Of all the major states, Florida is the fastest growing, and consultants to the Commission on Population Growth and the American Future have predicted that Florida's current population of about 7 million (up by more than 4 million since 1950) will double by the year 2000.

- Well over half of Florida originally was made up of wetlands, and, despite the extensive drainage projects of the past, the amount of land in South Florida suitable for intensive development is quite limited. Florida's hydrologic and ecologic systems are, for the most part, susceptible to easy upset. For instance, the digging of drainage canals across South Florida's flat, low-lying terrain alters the hydrology and ecology over a wide area (see Fig. 1). Also, the quality of life in Florida's urban and suburban area has generally been deteriorating as the result of poorly controlled growth and development, which is especially unfortunate in a state where tourism and living amenities are emphasized.

- Floridians are highly ambivalent toward land use controls. Some people, perhaps a majority, see such measures as essential to avoiding the wholesale degradation of a subtropical environment that lured many of them to Florida in the first place. But others are more concerned about defending what they hold to be the rights and prerogatives of private property. Except in its control of the use of submerged or tidal lands, the state does not yet seem to have really brought itself to the probably necessary step of protecting its basic land resources largely through exercise of its police powers, with compensation to the land owner only when the restrictions imposed are such as to leave him no productive use of his property.

The new land use legislation enacted by the legislature in 1972 came as the direct result of Florida's drought of 1971. Occurring as a cyclical phenomenon, droughts are not unusual in Central and South Florida. This last one was of unusual severity, however, endangering both the southeast coastal area and its vast hinterland made up of the Everglades and the Big Cypress Swamp. Falling water tables caused some Miami wells to "salt up" from the intrusion of seawater. Huge fires raged in the Big Cypress and the Everglades, and, besides destroying vast stands of pine and cypress, consumed much organic soil.

The consequences of the drought were sufficiently alarming that Governor Reubin Askew called a special South Florida water management conference that brought together conservation leaders, local and state officials, some key state legislators, and a number of engineers and scientists from state and federal agencies and Florida universities. In its report, the conference recommended that a comprehensive South Florida land and water use plan be developed and enforced by the state and by regional boards named by the governor. A major point of consensus was that the way to meet the problem of recurrent droughts was through controlling and limiting growth and development rather than through building more engineering works for further manipulation of South Florida's water resources.

Following up the conference, Governor Askew assigned a task force to come up with specific legislative recommendations. A consultant to this task force, Fred P. Bosselman, a Chicago lawyer, had had a major part in preparing the American Law Institute (ALI) draft Model Land Development Code, which was the basis for the national land use legislation then making its way through Congress. Because of this coincidence both the legislation subsequently enacted by the Florida Legislature and the proposed federal legislation came to be based largely on the concepts set forth in the ALI code.

According to these concepts, state government would take a highly selective approach to land use regulation, focusing on what has been termed the "big cases." Such cases fall into three broad categories of problems:

1) The protection of areas of "critical state concern" such as biologically rich wetlands or important watersheds.

2) The regulation of large-scale development (cited in the Florida legislation as "development of regional impact") such as a major subdivision, a large shopping center, or a new airport.

3) The regulation (and fostering) of "development of regional benefit," as in the case of necessary but often locally unwelcome facilities such as public housing which might be arbitrarily excluded by municipal zoning.

Development in critical areas would be subject to special orders designed to

protect natural hydrologic and ecologic systems. Proposed developments of regional impact or regional benefit would be analyzed from the standpoint of their economic, social, and environmental impact, with development permits to be granted if, on balance, the impact appears favorable.

Implementation of this regulatory regime would be left in the main to the local governments, subject to state standards and guidelines and to state review and approval of decisions coming up on appeal.

The land use bill recommended by the governor's task force and enacted by the legislature embraced the essence of the ALI code, although, instead of making developments of regional benefit a distinct category, this was folded in as part of the development of regional impact (or DRI) category. The measure was strongly opposed by some development interests, especially the Florida Association of Homebuilders, and it was nearly defeated even after its sponsors accepted a number of weakening amendments.

Perhaps the most drastic change was one limiting the amount of land that could be designated as of critical concern to 5 percent of all land in Florida —a highly arbitrary restriction inasmuch as many Florida scientists and landscape architects agree that less than half of the land in the state is suitable for intensive development. Another weakening amendment provided that the critical area program would take effect only after Florida voters had approved a $200 million bond issue for purchase of fee title or conservation easements to "environmentally endangered lands."

Approval of that bond issue by referendum would in fact come later in the year. Although there is no doubt whatever that the money can be well spent, to have made its availability a prerequisite for the critical area program was clearly undesirable. Property owners could be expected to press all the harder for compensation for *any* development privileges lost, no matter how reasonable the restrictions imposed or how harmful to the public interest unrestricted development might be.

Nevertheless, the new Florida law, a complex piece of legislation described here in only the broadest terms, is probably as strong a measure as the Florida legislature could have been persuaded to accept. As one prominent Florida environmentalist, Hal Scott, director of the Florida Audubon Society, told *Science*, this measure was "at the outer edge of what was achievable." Furthermore, whatever the shortcomings of the new law's highly selective approach to land use regulation, the demands that even this limited measure imposes on the existing state bureaucracy in Tallahassee are formidable and will not be met unless the grossly underfinanced and undermanned Division of State Planning is given more money and staff.

Indeed, the division's staff of 38 professionals is little more than half the size of the staff of the Metropolitan Dade County Planning Department in Miami. And, besides the staffing up that must be done in Tallahassee, effective

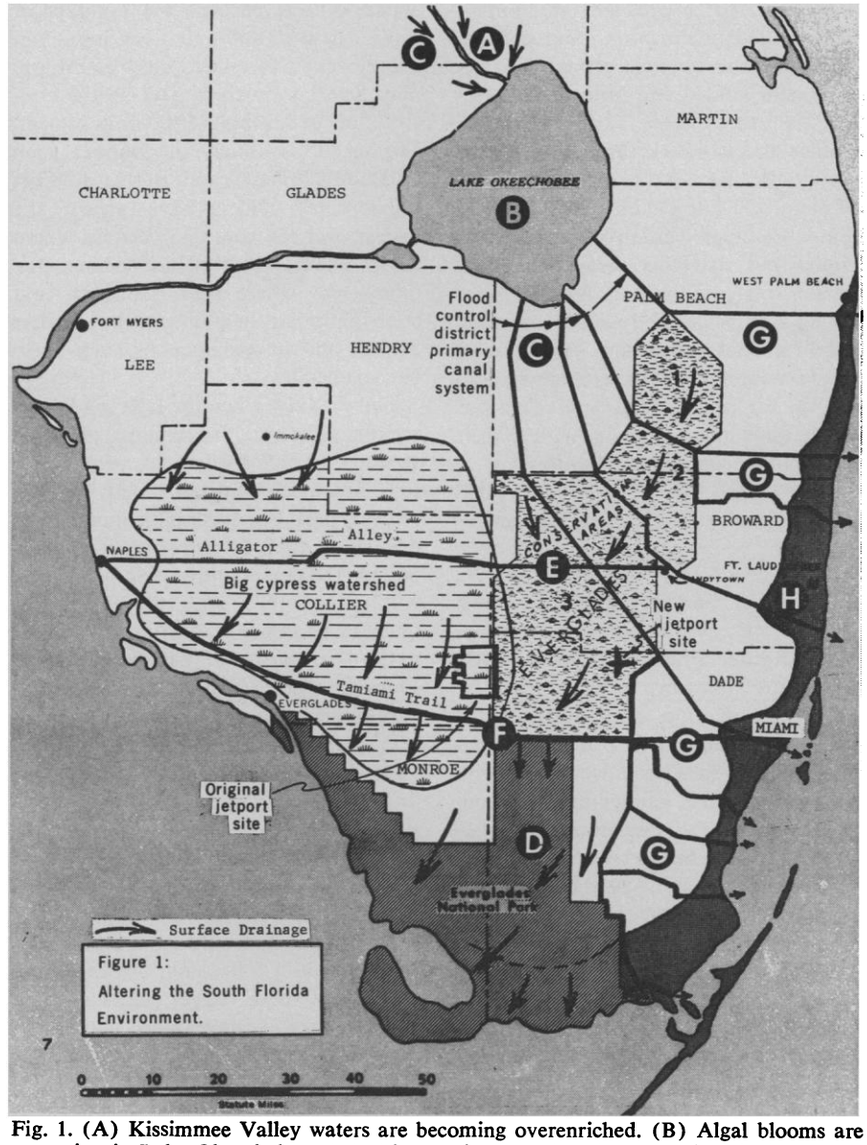

Figure 1:
Altering the South Florida Environment.

Fig. 1. (A) Kissimmee Valley waters are becoming overenriched. (B) Algal blooms are appearing in Lake Okeechobee. (C) After drainage and under normal agricultural use, the organic soils of the Everglades subside as a result of oxidation at the rate of about 1 inch per year. (D) The seasonal "hydroperiod" during which swampy conditions prevail and overland flows of surface water continue has been shortened from 8 or 9 months to 4 or 5 as a result of man's interference in the hydrologic system. Partly as a consequence of this change, the wood ibis and several other species of wildlife have become endangered. Also, the ecology of the mangrove zone, where tidal waters are freshened by the inflow from the Everglades and Big Cypress, is changed for the worse. (E) The Everglades Parkway, or "Alligator Alley," retards water flow. (F) Hunting pressures in Everglades–Big Cypress region are higher than desirable for quality recreation. (G) Many canals are grossly polluted, and through them some fresh water is still lost to the sea. (H) During the drought of 1971 the lowered head of fresh water in the Biscayne aquifer allowed seawater to move inland and contaminate parts of the aquifer. [The map and legend have been adapted from a report prepared in 1971 for the Florida Department of Transportation under the coordination of the Division of Applied Ecology, Center for Urban Studies, the University of Miami.]

implementation of the new land use law will depend partly on the participation of local and regional planning agencies which in most cases are not yet fully prepared to meet their new responsibilities.

Yet, while the new land use law may represent a significant and challenging step forward, it is an incomplete response to the recommendation of the Governor's Water Management Conference for a program of *comprehensive* land use planning and control. The conference wanted growth and development guided and limited wherever necessary to conserve basic natural resources and to check the decline in the quality of life. State Senator Robert Graham of Dade County, who was the new law's chief legislative sponsor, has emphasized that this measure is concerned solely with land use decisions having a substantial regional or statewide impact. "Local governments should continue to have total responsibility for those land use decisions which only affect persons within their jurisdictions, *including the decision to have no land use regulation at all*" (emphasis added), Graham has said.

A Process without a Policy

Moreover, the law does not lay down a *policy* of conservation and development to guide Florida's future growth. Instead, it prescribes a *process* for arriving at—to quote a member of the task force that drafted the law—decisions based on a "balanced consideration of all the competing environmental, economic, and social factors." This emphasis on a balancing of interests on a case-by-case basis is the hallmark of both the Florida law and the proposed national land use law.

Given the fact that implementation of the Florida program is just now beginning, any judgment as to its ultimate success or failure would be premature. Nevertheless, both from experiences of Florida's recent past and from what is happening in the state today, one can foresee three major categories of problems arising, or continuing, under the new program of land use control. Furthermore, these problems are generic and offer an insight into the limitations of the proposed national land use legislation as well as those of the new Florida law.

1) *A program of land use regulation oriented to the big cases is not responsive to problems stemming from the kind of growth which, while occurring in small or modest individual increments, is cumulatively massive.*

According to guidelines adopted by the state earlier this year for identifying developments of regional impact, a residential development proposed for a county of 500,000 population or greater is to be considered a DRI only if it would contain at least 3000 dwelling units (lower thresholds would apply in less populous counties). Some Floridians feel that a perverse logic is at work here, because the building of three new 1000-unit condominium complexes in a place such as Miami may have as much impact as the construction of a single 3000-unit project. Further, it is chiefly in counties such as Dade (Miami) and Broward (Fort Lauderdale) which have grown the fastest over the past two decades where environmental quality has declined the most—and where state standards and oversight might help ensure that further growth and development is such as to be beneficial.

Since 1 July, when the DRI guidelines became effective, the regional planning agencies (which by law are responsible for preparing impact analyses for DRI's) have received indications from developers that, by July 1975, the number of DRI's submitted for processing will exceed 900, with 90 percent of them to be residential projects. Almost a third of the total will be in South Florida, which consists largely of that part of the state below Lake Okeechobee and includes the populous Gold Coast area stretching from Palm Beach to Miami Beach.

According to M. Barry Peterson, director of the South Florida Regional Planning Council, his agency already has reviewed about a dozen DRI's which together would add more than 80,000 units of housing. At the same time that these large projects were being proposed, developers within the region were seeking local permits for a multitude of smaller projects falling below DRI threshold levels. The total number of dwellings to be contained in these smaller projects, Peterson believes, is substantially *more* than 80,000 units.

Even if the threshold for DRI's were set much lower, a huge volume of new construction would continue within essentially the regulatory purview of local government, with the state having a voice only in relation to a few special questions such as pollution control and the protection of beaches and tidal wetlands. In Florida, "local government" means 67 counties and almost 400 municipalities, varying enormously in their competence and willingness to insist on high standards of development. There are almost 100 municipalities in the three Gold Coast counties alone.

A conspicuous example of the problem of incremental growth can be seen in the city of Miami, which, according to the Miami *Herald*, has over the years kept its zoning board largely in the hands of political hacks. For the last year or so the residents of Coconut Grove, one of Miami's more pleasant neighborhoods, have been indignant about the so-called Fair Isle project, an undertaking by a local developer to build four 40-story condominium towers on a small spoil island a few hundred yards off shore. The residents have protested that this project of 1000 living units would increase congestion on Bay Shore Drive, add to the flow of sewage to Miami's overloaded Virginia Key treatment plant, and change the character of their community much for the worse. Some of the city fathers have joined in the hand-wringing over the Fair Isle towers, but it is Miami's own zoning policies that have made this project possible.

The Fair Isle dispute is symbolic of numerous similar controversies which, at any time, one can find raging in fast-growing communities along Florida's Atlantic and Gulf coasts.

2) *To give special protection to a relatively few "critical" areas is at best a half measure in a large state (58,560 square miles) where the greater part of the total land area is environmentally sensitive.*

This point can readily be illustrated by reference to the critical-area program as it may be used to protect some of Florida's principal groundwater resources. First, consider the matter of the Green Swamp, an area in Central Florida of about 800 square miles which contributes significantly to recharging the Floridan aquifer, on which much of Florida largely depends for its fresh water. Of the half dozen places thus far listed by the Division of State Planning for possible critical area designation, the Green Swamp is, along with the Big Cypress, being given priority consideration.

But protecting this swamp is not the only, nor even the most important, step necessary if adequate recharge of the Floridan aquifer is to be maintained. According to W. F. Lichtler, a U.S. Geological Survey hydrologist formerly stationed at Winter Park,

Florida, and an authority on Florida's groundwater resources, the principal area of aquifer recharge is the sandy, citrus-clad hills of the Central Highlands, which extend three-quarters of the way down the peninsula like a misshapen backbone.

This carries important implications, for it means that the water resources of Central Florida cannot be adequately protected by a state land use policy which, focusing solely on the big cases, would have special protective regulations apply to certain specific places ("critical areas") and situations (DRI's). What is needed is a state land use policy to protect important resources wherever they are found. In this instance, while all development would not be excluded from the highlands citrus areas, the conversion of groves to urban uses would probably be strictly limited and controlled. Otherwise, extensive areas within the highlands might be covered with retirement housing, streets, parking lots, and shopping centers, with much rainfall running off as surface water rather than percolating into the aquifer.

Any attempt to apply the critical area concept over a number of really large areas may be no less difficult politically than to require, as a matter of general state policy, that *all* land in Florida be classified and regulated according to its most appropriate uses (whether for development, agriculture, preservation, or a mix of uses in a "conservation" category). The controversy over the proposed critical area in the Big Cypress watershed is a case in point.

Last June, the legislature, acting at Governor Askew's urging and with many legislators giving little thought to what they were doing, passed a special act to have a critical area designated within this important watershed. The act's stated purpose was to give early protection to the 570,000 acres within the proposed Big Cypress National Fresh Water Preserve and to such "contiguous" lands and water areas as are "ecologically linked" with Everglades National Park, the Ten Thousand Islands, and the shallow aquifer of Southwest Florida.

In late August, the Division of State Planning proposed that more than three-fourths of the entire watershed, or some 1.2 million acres, be designated as critical. Besides the large acreage in the proposed national preserve where all land would be under public ownership or easement, the critical area would have included an additional

The EPC: Environmental Lobby

Leading and coordinating conservation interests in lobbying for land use control legislation is a relatively new group called the Environmental Policy Center (EPC). The purpose of the group, established in Washington, D.C., in early 1971, is, in the words of director Joe Browder, to "concentrate on influencing, through Congress and the Executive Branch, public policy on a few key resource and environmental issues."

The EPC, unlike most environmental organizations, engages in overt lobbying activities; therefore, contributions to it are not tax deductible. Browder says that, in order to avoid competing with other groups, his outfit is not a membership group. It acts instead as an action arm and research resource for other concerned organizations. The Sierra Club, for example, pays EPC's rent in return for research on strip mining and related issues. The budget for the center—estimated at $168,000 for 1974—is derived from private donations and the sale of research and information services.

Staff of Youthful Environmentalists

The youthful, 11-member staff is comprised of people formerly associated with such groups as Friends of the Earth, the Sierra Club, and Ralph Nader's Public Interest Research Group. In addition to land use, their major areas of concern are strip mining, water resources, and selected energy issues. David Calfee, a 27-year-old lawyer who formerly worked for Nader on energy issues, has been working since the beginning of the year as chief coordinator for environmentalists seeking to guide proposed land use legislation. Louise Dunlap, former coordinator of the Coalition Against the SST, is now coordinator of the Coalition Against Strip Mining (which the EPC put together) and leads environmental lobbyists on this issue. The coalition favors eventually phasing out all strip mining; meanwhile, it is credited with having been influential in getting strict and explicit standards for land reclamation built into the strip-mining bill passed last month by the Senate.

The center has been strongly critical of the fact that energy industries tend to have a monopoly on resource information needed for policy-making, so it does a good deal of its own research. From such research, the EPC argues that the ratio of deep-mine coal to strippable reserves is more like 30 to 1 than the 3 to 1 cited by the coal industry on the basis of its wholly different assumptions.

One of Browder's principal concerns has been to save Big Cypress Swamp, which acts as a watershed to the Everglades National Park. Browder has helped lead efforts to get the federal government to buy the area, containing over 500,000 acres, before it becomes irrevocably damaged by real estate developers and oil seekers. In October, the House finally voted to authorize $116 million to buy it and create a Big Cypress National Preserve; EPC is optimistic that the Senate will follow suit.

Other experts at EPC are Barbara Reid, who worked with David Zwick, a Nader man, on passage of the Federal Water Pollution Control Act of 1972; Wilson Clark, an energy systems expert who does research on nonfossil fuel energy sources; Brent Blackwelder, who specializes in the Byzantine mysteries of federal water resources development; and Barbara Heller, an authority on deepwater oil terminals and offshore oil exploration (she and her husband Rick Heller were also active in the Coalition Against the SST).

The EPC, which operates out of a third-floor walk-up office on Capitol Hill, is a "hand-to-mouth" operation, says Browder. Salaries range from $6,500 to $15,000. But its reputation appears to have achieved a solid footing. By confining its lobbying to a few carefully selected areas of legislation, the EPC has been able to wield an influence that is acknowledged by congressional staffs and respected by opposing industry lawyers and lobbyists.—C.H.

650,000 acres to be protected through regulation, with no assurance that property owners would be compensated for restrictions placed on use of their land. As then defined, the boundaries of the critical area would have embraced about 90 percent of Collier County, whose officials had, during the 1960's, allowed rapacious land sales and development practices to begin in the Big Cypress on a grand scale.

The critical area plan was received by the county officials with much resentment. This was in part because, as provided by the special 1973 act, the Division of State Planning had itself prepared the regulations restricting drainage, construction practices, and the like, whereas under the land use law of 1972, the county commissioners would have been given a chance to prepare these regulations. But it was among developers, farmers (some of the higher land in the Big Cypress is arable), cattlemen, and other owners of land in the watershed that the critical-area proposal caused the greatest uproar (and this despite the fact that, under existing law, farming activities and such development projects as have already been authorized by local ordinance are exempt from regulation).

Earlier, there had been bitterness among owners of the land to be acquired for the national preserve. Now, many owners of property in areas contiguous to the preserve also were outraged. They felt particularly aggrieved at the fact that *their* land would be subject to possibly noncompensable regulation, whereas land within the national preserve would not be.

Backing away from its initial plan, the division of planning prepared a new one, with the boundaries of the proposed critical area reduced by more than half. Now, only 285,000 acres outside the national preserve were to be included, with the greater part of this acreage to consist of coastal wetlands and major freshwater sloughs clearly unsuited to any but the most limited development. On 20 November, the much-shrunken Big Cypress critical area proposal was approved by a 6 to 1 vote of the Florida Cabinet, a collegial body made up of the governor and six other independently elected officials which by law had the duty to fix the boundaries. Interestingly, the one dissenter was the commissioner of agriculture.

Yet, even with the Cabinet's acceptance of the boundaries as drawn, the legislature may later exclude everything except the land designated for the national preserve. A bill drawn up by a Collier County legislator would do just that, and more than half of the members of the Florida house of representatives and more than half the senate already have joined as cosponsors of this measure. Most legislators appear to regard the Big Cypress critical area proposal as a product of overzealous state planners rather than as a faithful expression of their own duly enacted policies.

From the foregoing one may wonder whether those who believe in a strong role for the state in land use regulation should not seek to have this issue fought out politically on questions of policy applicable statewide rather than on questions such as critical area boundaries. Conflict over the application of general policy to specific situations is of course inevitable, but, in the regulation of the use of tidal lands, the Florida cabinet has demonstrated an ability to do this successfully. Since 1967 the cabinet has been applying environmental criteria to its review of local government decisions on dredge-and-fill permits and the establishment of bulkhead lines.

3) *In the absence of comprehensive state and local land use policies, consideration of projects of potentially great impact on regional development will necessarily proceed in an ad hoc manner. Opportunities for shaping and implementing a beneficial growth strategy are likely to be overlooked, and, in some cases, major land use conflicts will occur.*

Important as the selection of sites for major facilities may be to regional development, Florida's Land and Water Management Act does not bear directly on this problem. The designation of a critical area might preclude putting such a facility in certain areas. Or the analysis of the project as a DRI might show whether it would fit in well at a particular place. But this is not the same as to take up the question of where the facility should go—and, indeed, whether it should be built at all—in the broad context of regional growth strategy. How important such an approach can be is illustrated by the tortuous manner in which a site has been chosen for the regional jetport that may be built in South Florida before the turn of the century.

There is some question now whether this jetport will in fact be built, and, if it is built, whether it will be a huge facility for the whole of South Florida or rather a smaller facility serving as part of a complex of several regional airports. But, if a large jetport is constructed, it could—depending on its location—influence how tourists are distributed among various South Florida resorts. Also, if studies commissioned by the Dade County Port Authority are correct, such a facility would generate enough employment to support a population of several hundred thousand.

Boiled down to the essentials, what has happened with respect to designating a site for this enormously important facility is as follows:

In the fall of 1969 the Nixon Administration, responding to the pleas of environmentalists, demanded that the Dade Port Authority (DCPA) remove a pilot training facility from a site in the Big Cypress Swamp (Fig. 1) near Everglades National Park and give up its plans to build the big regional jetport there. As a consequence, the DCPA entered into a formal "Jetport Pact" with the U.S. departments of the Interior and Transportation and the governor of Florida to find a mutually agreeable site.

In 1971, a $1.2 million site selection study was begun, and last year a committee which in effect represented the Jetport Pact signatories recommended that the DCPA choose a 50-square-mile site in north Dade, some 10 miles west of metropolitan Miami and largely within an Everglades water conservation area. Earlier this year, the Dade Metro commission, which underwent a change of leadership after last fall's county elections, surprised everyone by voting to reject the new site. It did so because of protests by citizens groups in north Dade who regarded the jetport, together with the pilot training facility that would precede it, as a potential nuisance. In July, however, the commission reversed itself and accepted the site, provided that the runways are placed deeper in the conservation area (and thus farther from metropolitan Miami) than was originally planned.

The disadvantages of putting another large growth-inducing facility in Dade County were not weighed by the site selection committee, even though Dade already had more than a seventh of Florida's total population and was suffering from problems of runaway growth. The committee had, at one of its early meetings, even rejected the proposal of one of its members for

a full investigation of an attractive alternative site available in an unpopulated part of Palm Beach County, outside the system of water conservation areas and at least as convenient to Miami as the original Big Cypress site.

On the other hand, the site selection committee had no mandate to formulate a growth policy for South Florida and there was no existing state policy for it to steer by. Furthermore, the scope of the search for a site was severely constrained by the need to find a site where the DCPA could operate facilities under its exclusive control. Had the jetport site selection study been done under the auspices of the South Florida Regional Planning Council, its scope might have been wider and its objectivity greater. But this regional council, like all advisory planning bodies made up of representatives of county governments, is politically weak and almost certainly not able to make controversial decisions as to growth policy.

Need for a Comprehensive Policy

Last August, Bosselman, mentioned earlier as one of the formulators of the ALI model code and as a legislative consultant to the state of Florida, made a possibly prophetic speech to an American Bar Association group interested in land use. "In the 1960's the question was *whether* state government had any role regarding the use of land," he said. "In the early 1970's the issue is *how* the state government should involve itself with land use; in the late 1970's the issue will be, What can we do to make some sense out of all this state involvement in land use?"

Here, Bosselman was alluding not merely to the involvement of state government in land use regulation through measures such as Florida's Land and Water Management Act, but also to the tendency for actual and proposed federal regulations in a variety of fields—such as pollution control, power plant and airport siting, and protection of wetlands—to require the states to regulate land use for specific environmental ends. Bosselman concluded by indicating that only through comprehensive state planning would it be possible to accomplish those ends while at the same time accommodating society's needs for various kinds of development. In his opinion, "the proper role of state government in the 1970's should be to undertake comprehensive planning for the development of all lands of the state."

By adopting a comprehensive policy for land use planning and regulation, a state such as Florida could in fact cope with the kind of problems described in this article. Limited as the supply of readily developable land is in some regions, Florida is not yet near the "limits of growth." Indeed, the solution to the state's present growth problem would seem to lie less in imposing population ceilings (appropriate as these may be in certain places) than in seeing that development occurs only at the proper time, at suitable locations, and in ways conforming to such environmental standards as are necessary to preserve Florida's natural resources and to make its urban areas truly agreeable and fit for people. To be coherent and effective, the state policy should not rest simply on a vague concept of "balancing" competing interests but should be informed by a vision of what Floridians want Florida to be like.

Besides the formidable political obstacles that would have to be overcome before such a policy could be adopted, however, some major reforms will be needed in the structure and competence of state and local government, particularly of the latter. The Florida Land and Water Management Act is sound in providing for the new regulatory regime to be implemented by local government under state guidelines and review, for it would be manifestly unwise to have the state bureaucracy try to cope directly with all details of land use regulation in a state as large as Florida.

What seems urgently needed is for the state to give overall responsibility for land use planning within each particular county to a single governmental entity within that county. This entity could be either a consolidated countywide government or a metropolitan government superimposed over a number of municipalities (Dade Metro controls land use only in Dade's unincorporated areas). The land use plans prepared by such entities (many of which would need strong financial and technical support from the state) would follow policies prescribed by the state and, taken together, would make up the state plan. Through its review of county plans, the state would seek to ensure their consistency with state policy and their mutual compatibility.

In the attempt made in this article to deal succinctly with a large and complex subject, some things of possibly great potential significance have not been touched on at all. For instance, there is the attempt by the Division of State Planning to build a strong information base and to lay the basis for coordinating various state programs around common objectives. Also, Florida's Coastal Coordinating Council was preparing, even before the enactment of the federal Coastal Zone Management Act of 1972, an advisory atlas delineating development, conservation, and preservation zones. And, to cite an instance of progress at the local level, Dade Metro is preparing what promises to be an environmentally sophisticated general land use master plan. The "growth issue" is being discussed throughout much of Florida, and at least two conferences have been held on this subject within the past year.

Yet, while there is indeed movement in Florida toward a comprehen-

Daddario Gets OTA Post

The appointment of Emilio Q. Daddario as head of the new Office of Technology Assessment finally became official as of 1 November, the day President Nixon signed the bill creating the new office and Congress passed an appropriation of $2 million for its operation in fiscal 1974.

The OTA, described by some as the legislative branch's equivalent of the now defunct Office of Science and Technology, will start out with a permanent staff of about 20. Assuming appropriations increase (an annual budget of $5 million a year is authorized), the staff will eventually grow to about 60.

Daddario, former Democratic congressman from Connecticut, began discussing the OTA idea in 1965, when he was chairman of the science subcommittee of the House Committee on Science and Astronautics.

sive state land use policy, the Land and Water Management Act, based on the ALI model code and concerned with the big cases, stands as a fair mark of Florida's present midway position on the long path toward such a policy. And, given the close conceptual linkage between this Florida law and the pending federal land use policy legislation, the limitations of that law are of national significance.

—LUTHER J. CARTER

Erratum: In the article by Luther J. Carter "Land use Law (I) . . ." (16 November), the last sentence in the second column on page 694 should read, "With some exceptions, little or nothing has been done by either federal or state government to cope with the ultimately more serious problem of protecting the land itself."—

RECENT DEATHS

Gordon Alexander, 71; retired head, biology department, University of Colorado, Boulder; 21 July.

Orville L. Bandy, 56; former chairman, geological sciences department, University of Southern California; 2 August.

Rolf L. Bolin, 72; professor emeritus of marine biology and oceanography, Stanford University; 22 August.

Lan Jen Chu, 59; professor of electrical engineering, Massachusetts Institute of Technology; 25 July.

Steve Pratt, 55; professor of psychology, Wichita State University; 28 July.

Wiley B. Sanders, 75; former professor of sociology, University of North Carolina; 10 August.

Howard V. Smith, 73; professor emeritus of agricultural chemistry and soils, University of Arizona; 10 August.

C. Martin Spooner, 71; retired chief, urology department, Toronto Western Hospital; 4 June.

Harold I. Tarpley, 75; professor emeritus of electrical engineering, Pennsylvania State University; 8 August.

T. Ivan Taylor, 63; professor of chemistry, Columbia University; 27 July.

James M. Williams, 97; professor emeritus of sociology, Hobart and William Smith Colleges; 7 August.

RESEARCH NEWS

Glassy Metals: No Longer a Laboratory Curiosity

Ever since a primitive blacksmith first discovered that quenching an alloy of iron and carbon with water could greatly increase the strength of the resulting steel, the world of the metallurgist has been heavily weighted toward the proposition that the most useful properties of metallic alloys often result when nonequilibrium structures are obtained. The principal means for obtaining such nonequilibrium structures has been some variation of the quenching process, that is, the cooling of an alloy so rapidly that the equilibrium structure characteristic of the lower temperature does not have time to form and the high-temperature structure is retained.

Now, the fascination of the materials scientist and solid state physicist with amorphous or noncrystalline materials in combination with the older metallurgical idea of quenching is giving rise to a class of solids known as amorphous metallic alloys or glassy metals. There is a growing interest among theoretical and applied researchers alike in the mechanical, magnetic, and electrical properties of these materials.

When a molten metal or metallic alloy is cooled, the solid phase formed is crystalline, with a structure that depends on the particular alloy composition. In contrast, molten glass-forming materials, when cooled, do not assume a crystalline structure, but instead retain a structure somewhat like that of the liquid—an amorphous structure. In each case, the thermodynamically stable or equilibrium structure at room temperature is crystalline. The difference between the two is in the kinetics or rate of formation of the crystalline phase, which is controlled by factors such as the nature of the chemical bonding and the ease with which atoms move relative to each other. Thus, in metals, the kinetics favors rapid formation of a crystalline phase, whereas in normal glasses the rate of formation is so slow that almost any cooling rate is sufficient to result in an amorphous structure. Glassy metals are formed when the molten metal is cooled sufficiently rapidly that crystallization is suppressed.

There are at least four methods of obtaining glassy metals, only one of which involves rapidly cooling, or quenching, a molten liquid, although all in effect quench by suppressing the rate of crystal formation. The other methods are vacuum evaporation, sputtering, and electrodeposition and "electroless" deposition. The first report of an amorphous metal produced by quenching was that by Pol Duwez' group at the California Institute of Technology, Pasadena; they obtained an amorphous alloy consisting of 75 percent gold and 25 percent silicon by propelling small molten globules against a thermally conductive metal substrate at high velocities. Amorphous specimens produced in this way were foils varying from less than 1 to a few micrometers thick. Alloys made by liquid quenching are limited to one of two groups. The first is composed of alloys made from either a transition or a noble metal and a smaller metalloid element, such as alloys of palladium and silicon or iron, phosphorus, and carbon. The second is composed of alloys made from transition metals only (intertransition metal alloys), such as copper-zirconium.

Vacuum evaporation, in which the starting alloy materials are vaporized by heating in some way and then deposited onto a substrate cooled to the temperature of liquid nitrogen (77°K) or below, is a method for producing thin films of amorphous metallic elements, as well as a wider variety of alloys than by liquid quenching. Sputtering, like vacuum evaporation, can be used to make a wide variety of alloy compositions. A target of the desired composition and a substrate are placed in an ionized gas (plasma) maintained by an electric field. The gas ions are accelerated toward and knock atoms from the surface of the target, which are deposited on the substrate to make a thin film with an amorphous structure. Electrodeposition (the familiar nickel-plating process) is used to make alloys of phosphorus and either nickel, iron, cobalt or palladium.