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PLANNING THE LAND FOR THE FUTURE[1]

By Professor L. DUDLEY STAMP

DIRECTOR OF THE LAND UTILIZATION SURVEY OF BRITAIN

SOME apology is needed for my appearance on this platform to-night in the presence of those much more directly concerned with the subject-matter of my address, for I am in this country as a student and not as a lecturer. There are so many aspects of land planning which have been so successfully considered here—I may refer, for example, to the magnificent series of national and state parks—and the subject in relation to the economic difficulties of the present time is one so much to the fore in America that it is only natural for a European to come here to attempt to observe and learn. As director of the Land Utilization Survey of Britain—a survey that aims at making a record of the present use of every single acre of England, Wales and Scotland as a basis for comparison with the past and of planning for the future—I have been close to the problems of land planning in Britain for the past three years and seized with avidity the invitation extended by Dr. Isaiah Bowman, chairman of the National Research Council, to spend a year in America in order to get an international view-point on the problems of land planning before preparing any report on the British Survey. My observations will thus be influenced by a comparison of conditions in Europe, especially Britain, with what I have seen in the course of the past year in 47 out of the 48 states of the Union as well as in Canada, the West Indies and in ten of the countries of South America. But I offer these observations in a spirit of inquiry and not as fixed precepts.

[1] The Hector Maiben Lecture of the American Association for the Advancement of Science, delivered at Berkeley, California, June, 1934.

THE APPROACH TO PLANNING

The land is the heritage of all. It does not matter whether or not we own a tract of the earth's surface, whether or not we are directly concerned with the

business of wresting from nature the fruits of the earth. Whatever our nationality, whatever our occupation, for most of us our mortal life is lived on the surface of the earth. As nations the land is the one ultimate asset that we have: as individuals it is upon the surface of the land, its natural beauties or its man-made ugliness, that we are compelled to gaze most of our waking hours. It is in this sense, without any question of ownership, that planning the land is the concern of everybody. No one who has driven for months, as I have done, through the length and breadth of the United States, could fail to be impressed by the size of the country, by the vast areas involved. But, however vast, one is impressed by the fact that everywhere, from Atlantic to Pacific, the land is known, there are no new areas awaiting discovery. The same is surprisingly true of the whole world. Some years of my life I spent in the rather remote country of Burma in a search for oil and minerals. With only one entry available for modern transport for an area of a quarter of a million square miles, with much of its area accessible only by bullock carts limited to 15 miles a day or by mule back, even a thousand miles up-country from Rangoon one finds a country organized, even sophisticated to the extent of knowing jazz from an ancient Victrola. Again the impression that the Age of Discovery is over. We may indeed truthfully say that the Age of Consolidation has succeeded the Age of Discovery. With so much of this country but a couple of generations removed from the days of the covered wagon, we scarcely need to be reminded that when settlement was made in a new area, pioneering was the job of every one who went into that area. It could not be left to the few. So to-day the work of consolidation is the concern of everybody; we are all of us land-planners. By the care or lack of care which we bestow on the lot surrounding our home we can please or offend the eye of the passer-by; by our appreciation or otherwise of the public parklands we influence the thoughts and actions of those we appoint as professional land planners; by the numbers of empty cans we leave behind we influence the value of a camp site or a beauty spot to the nation at large. Planning the land for the future is essentially the work of securing the optimum use for the benefit of all. Every one has a share, but none must have a dominant voice. It is essential to balance the often conflicting claims of the farmer, forester, miner, industrialist, home-owner, traveler, pleasure-seeker; to secure a balance between town and country development, between the economic and esthetic needs of the nation. Too often the work of planning the land for the future is regarded as exclusively the province of the town planner who is concerned solely with urban growth: alternately it is considered as the work of the agricultural economist who is concerned with production. Actually, successful and lasting land planning must be a cooperative work carried out for the benefit of all and made possible by the good-will of all.

The Seven Stages of Planning

Shakespeare has immortalized for us the seven ages of man, a succession of stages in human development as true to-day with but minor variations as three hundred years ago. I believe that a successful planning of the land will proceed by stages and that there is an inherent danger, too apt to be overlooked to-day, of passing over any one of those stages. It will not do to push the analogy too far, for one hopes that the final stage of planning will not resemble the final stage of senile decay in the human being.

In the first place, there must be the recognition of the need for planning. Many arguments may be used to prove the need, but it is both interesting and important to note that different appeals may be made, adapted to different types of psychology. The building of the Norris Dam in the Tennessee Valley area will result in the formation of a large lake and the submergence of a bridge built but three years previously at a cost of about a million dollars. This fact may be used to demonstrate the possible waste of public money when a long-range plan is absent. A social worker may be appalled at the sight of New York's children playing in an uptown cross-street, motor traffic being asked to avoid the "play-street" as far as possible. It is a state of affairs which may be used to illustrate the need for town planning which shall consider the recreational needs of the people. Who has not seen a pleasant residential area ruined by the erection of a factory in its midst? The real estate man is often, quite unjustly, regarded as the enemy of planning. Where he sees possibilities of profit disappearing he may be, but in such a case he suffers, together with the residents, through the absence of planning. A tract of land, too poor for farming, may have little value as a whole for real estate development, but put a high-speed parkway through it with restricted frontage rights (as Westchester County of New York State has done) and note the jump in value of the adjoining land. Thus the recognition of the need for planning will depend upon the individual point of view.

The second stage in planning is education—the education of the people to see the need or, expressing it more bluntly, "selling the idea." It will be clear that the appeals to be made will vary with the audience, but let us always look upon land planning as something lasting, something which after all will not be accomplished in a moment but which depends upon continued cooperation for its success. What, then, can be more important than that the rising generation,

the children in the schools, should be made familiar with the idea of planning? It is a very essential part of their training as citizens, and children are quick to learn how they can do their share to ameliorate existing conditions. It may only be keeping tidy the vicinity of their school, but a local pride is not too difficult to foster. I have in mind the very delightful campus of a large training college in one of the eastern states. The grass is green and smooth, yet there are no fences, no commands to "stay out." Instead is expressed the desire of the planner and the reason—"Don't cross here, keep the campus beautiful." Selling the idea to the children does not mean preaching against the existing order. It can combine respect for what has already been done with the desire to carry on the work of those pioneers by increasing efficiency and beauty.

But in talking about the educational aspect we have rather overrun the third stage—the all-important stage of research into the problems involved. The proper utilization of the land must depend primarily on the potentialities of the soil. The utilization of any given area may vary from time to time within certain limits according to the economic requirements of the moment or may be profoundly changed by alterations in the facilities for communication or transport. There is a very real danger that the urgency of formulating plans for immediate adoption consequent upon the economic depression may blind us to the fundamental natural factors which must always exercise a controlling influence on land utilization. There is no short cut; nothing can remove the necessity for the painstaking scientific investigation of climate, soil and vegetation cover, to mention but the chief of the natural factors involved. Such investigations are concerned with factors which will be operative a hundred years hence when the economic set-up may be completely changed.

Research into both the geographic and economic factors involved should lead to the fourth stage, the formulation of a plan of development, but this stage is incomplete without the thorough examination of the plan. Whilst scientists are popularly regarded as above the petty human emotions, there is yet a lurking fear that they are not entirely free from a degree of jealousy. In planning the land one investigator is so apt to consider his point of view as the only really significant one; the agriculturist is apt to be so obsessed by the significance of soil fertility that he may be shocked to find the town planner has not even considered this factor and had lightly chosen (unwittingly, of course) an area of finest alluvial soil as the area for industrial development. So any plan must be thoroughly discussed from all angles and a united front presented before entering on the fifth stage—education and publicity. I am convinced that successful planning is planning for the benefit of the majority; in a democratic country there is nothing to be feared in putting such a plan before the public. I am aware that vested interests and political considerations may at times intervene. But Wisconsin has made a success of going to the people with its plans, county by county, and opponents have become staunch supporters. In the work of publicity the press has an enormous influence. All too frequently scientific workers and planners are to blame in failing to present their material in such a way that it can be used by the newspapers. Planners would do well to note the enormous success of President Roosevelt's broadcast talks.

I will pass lightly over the sixth stage—the necessary legislation—because I believe that so much depends on the adequacy of the work in the preceding stages. There will be no difficulty in securing the passage of the necessary measures if the ground has been well prepared. The legislation is not concerned primarily with ownership but with the course of development. The final stage is execution and administration, where the keynote of success is popular cooperation. Who has not observed the delightful results of friendly rivalry between neighboring home-owners in the attempt to beautify their gardens? Too often in a village all are apathetic; but let three or four launch an attempt at improvement, the influence of their movement will soon be apparent throughout. Successful land planning must depend in just the same way on the spontaneous development of public interest, independently of financial considerations.

The Land Utilization Survey of Britain

In suggesting that the work of planning the land for the future should proceed by a regular succession of stages I hope that I shall not be accused of suggesting what is desirable rather than what is practicable. I may be pardoned, perhaps, for referring to the work of the Land Utilization Survey of Britain, where some attempt has been made to put precept into practise. The bare 100,000 square miles of England, Wales and Scotland can not produce the quantity even of essential foodstuffs necessary to feed the 45,000,000 people of the area. Britain lives by selling her manufactured goods in the world's markets and, aided by her carrying trade and overseas investments, buys with the proceeds some 60 per cent. of all the food she consumes. The world-wide growth of nationalism makes such a national position as Britain's inherently difficult and may—indeed is—forcing Britain to a more intensive development of home resources. Hence the urgent necessity of recording, field by field, the present utilization of the land so that the relative importance of the factors influencing utilization—whether natural or geographic (*e.g.*, soil)

or economic—may be adequately studied area by area. Statistical comparisons fall short of what is required in that it is not possible without detailed mapping to correlate soil with crop and yield unless the area on the ground is known and mapped. Hence the recognition of the need and the aim of this "modern Domesday Survey" to record the use of every single acre of the surface. Such a record serves as a standard of comparison with the past and a basis of planning for the future, but there is the parallel need of interesting the people as a whole in the land and its problems. Hence the idea of getting the work carried out as an educational exercise in the colleges and schools. Britain is fortunate in the possession of a magnificent series of base maps—published by the Ordnance Survey, the central government map-making department—on the scale of six inches to one mile. These show buildings, roads and field boundaries (though they fall short of United States standards of topographical detail) and the work of the land-use surveyor is to record on each lot its present use. The six-inch maps are published in "quarter sheets," covering an area of three miles by two. The task may appear simple, but 22,000 of these sheets are required to cover Britain, and the work of securing 22,000 volunteers, all working along the same lines, was not an easy one.

The survey was organized on a county basis; in each county the director of education was asked to act as county organizer and each school was asked to be responsible for its own home area with the colleges and senior students undertaking areas more difficult in character or of access. There is little doubt that all over the country the interest of the young people in their land and its problems has been aroused; their parents, especially the farmers, took an active interest, friendly rivalry between neighboring schools (fostered occasionally by the offer of a small prize) was aroused and resulted in a surprisingly high degree of accuracy. In securing this "snap-shot" picture of the country in the years 1931 to 1934 it is estimated that 10,000 teachers and 250,000 children took part, and 85 per cent. of the whole area was covered by these youthful volunteers. But research had to precede as well as follow this work. First, advice was sought from official and unofficial bodies representing farmers, foresters, large land-owners, town planners, educationalists, local government authorities and others as to what information should be collected. Then (bearing in mind the unskilled helpers it was proposed to use) several simple schemes of land classification were drawn up and tried out in the field until one was found as near satisfactory as possible. This scheme was then embodied on a single leaflet, of which some 60,000 were used, thus securing uniformity. The record of the field work is contained in the file of manuscript-covered base maps and is the "raw material" which requires editing, reduction to the uniform scale of one inch to one mile and careful study before it can be used as the basis for planning.

In Britain much of the land has been used for many centuries and it is often true that nature has already dictated the proper use of the land—in any case existing land use is the result of the interaction of a variety of factors and is often indicative of the potentialities of the land. Successful land planning in Britain must start—as indeed it must in all countries—from the existing land uses and attempt to mould the development along sound lines; it must seek to disturb as little as possible the existing position. The town or country planner can not treat the country as if it were a blank sheet of paper, but must seek to develop gradually from the present position disturbing only the minimum number of interests in the process of development. The largest town-planning scheme in Scotland—that for Aberdeen—well shows this, whilst the use of a detailed land-use map as a basis of planning is shown in the schemes for North Wales and East Suffolk. This is the stage which may be called the formulation of the plan, but the Land Utilization Survey is attempting to do its share of publicity work by bringing the results of its work before the general public. The maps, on the scale of one inch to one mile, printed in attractive colors on waterproof paper, mounted on linen and folded in covers, give the tourist, the hiker or the motorist (who isn't in too much hurry) an almost complete picture of the countryside so that he can plan his trips to the greatest advantage. These maps are on public sale and are also being exhibited by several of the transport companies to show the attractive nature of country served by their round trip tickets. The honest realtor is beginning to discover that they can be used to demonstrate the delightful spots readily accessible from the property he is attempting to sell. His less honest rival can not do this. The Land Utilization Survey is not concerned with legislation and execution. In the Town and Country Planning Act, the legislation exists: the great task for the scientific investigator is to have his facts collected ready and properly marshalled for the administrator.

Good and Bad Planning

The last remark leads me to refer to what I believe to be the greatest present danger before the planner. It is that plans will be formulated and put into operation without an adequate study of the factors involved—that planning will overtake research.

A planned development can be just as defective as a development which depends on individualistic enterprise under a policy of *laissez-faire*. Indeed it can be far worse. For individualistic development is dictated

by the hope of personal advancement and takes places according to the individual's concept of future trend. A man believes a town is going to grow. He puts up a large hotel or indulges in real estate speculation. If his belief is wrong he is likely to lose heavily. The planner who plans according to mere beliefs has little to lose except other people's money and his own reputation. At the present time the world is passing through a period of severe depression. Plans based on the economic position of the moment are likely to be bad plans. So are plans which are purely national or local. Just at present it seems clear that Britain and the United States are tending to develop in opposite directions. In Britain the burning question is how can we make more effective use of our land, how can we increase agricultural production so as to be more nearly self-supporting. This point of view is common to many, if not all, of the nations of Europe. In the United States, on the other hand, attention is of necessity directed towards the evils of "over-production," the burning question is how to limit agricultural production and retire to other uses the poorer types of cultivated land. Such a state of affairs can only be possible in a thoroughly protectionist world. What of the future? Are our schemes of land planning to depend on the continuance of present tariff barriers? It has often been said that the United States constitutes the largest federation of free-trade nations in the world and, as a single great economic unit, can act independently of the rest of the world. But even as no man liveth unto himself and none dieth unto himself so we may say that no nation liveth unto itself and none dieth unto itself.

Modern improvements in transport and communications have made the world, whether we will it or not, a single unit, and I firmly believe that the progress and prosperity of any one part depends on the peace, progress and prosperity of the whole. It requires but a moment's calculation to show how minute changes in one part of the world may affect the whole course of world requirements and world trade. There are in India 350,000,000 people, of whom some 200,000,000 may be classed as potential or actual wage-earners. Yet the majority live but little removed from the starvation level at an average income probably not exceeding 16 or 18 cents a day. Let us just suppose that their earning capacity could be increased by the munificent sum of two cents per day. By this tiny change $1,000,000,000 would become available annually for the purchase of goods in the world's markets. Or take another example. The people of Britain with an extremely varied diet nevertheless consume an average of 3½ bushels of wheat per head per annum. The Chinese at present live for the most part on the starvation level, but where opportunities allow it is clear that they are developing a taste for wheat as their chief food grain. If they became as hungry as the British they would require roughly twice the total quantity of wheat produced in the whole of the United States. Even a moderate requirement of one bushel per head per annum would produce a new world demand of over 400,000,000 bushels. Of what use is it to classify huge tracts of land as not required for agriculture when such changes as these may be in course of happening at this very moment? Rather let us seek to learn the potentialities of our land, for all good planning must be long-range planning. For long-range planning there must be full and adequate study of two sets of factors:—(a) The natural background—topography with water supply, soil, climate, natural vegetation, wild life and existing utilization; in many ways the vegetative cover, natural and artificial, is the most important, for it affords an index of the interaction of the other factors. (b) Social and economic trends—the changing habits of mankind, whether it be the desire for smaller families, for new uses of increasing leisure or the development of a new sense of values including the esthetic.

It is sometimes said that the natural or geographic factors are no longer of importance, the economic factors are the only significant ones. The reverse is nearer the truth. A hundred years ago the people living in the wetter west of England, if they desired wheaten bread, had of necessity to grow their own wheat. But the dampness of the climate rendered the harvest uncertain and to-day, with foreign supplies from countries whose natural conditions are far more suitable, wheat is no longer grown. In other words, the geographical factors are influencing utilization to-day as they never did before. Incidentally, this example serves to suggest the folly of the artificial stimulus by legislation of the cultivation of crops for which a country is not suited by nature—economic development which is opposed to natural development is bound to fail in the long run.

It must not be concluded from the foregoing remarks that planning is useless because it can not be world wide. Let us plan our own house lot to secure the optimum use of the land available but with our eyes on the need for a treatment harmonious with our neighbor's land and with the knowledge that what we as individuals may do will have its influence on the lives of our fellow creatures even if they but pass by. It is difficult, for example, to gladden the heart of a fellow creature by displaying to his gaze our private cemetery of disembowelled but uninterred automobiles. Similarly, let us plan our town or our county with a view to the optimum use of all the land for the benefit of all, but bearing in mind the needs of the state as a whole and allowing by an elastic plan for

changes in the habits of mankind. Finally let us plan nationally so as to secure the best of our country, but not forgetting the world as a whole.

Wordsworth has truthfully said,

> . . . To the solid ground
> Of Nature trusts the mind that builds for aye,

and in planning the land for the future we must not neglect the steady solid work of inquiry which can not be done in a day or a decade and for the pursuit of which our universities and colleges need every encouragement. Then let us be reminded by the doggerel of at least one of the world's great troubles of the present day:

> The World is a bundle of hay,
> Mankind are the asses who pull
> But each tugs in a different way. . . .

If we plan efficiently and pull together there is plenty of hay for all.

ELEMENT 91

By Professor ARISTID V. GROSSE
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THE announcement at the recent meeting of the American Chemical Society in Cleveland of the isolation of 0.1 grams of protactinium oxide and the preparation of metallic element 91 has aroused quite a wide interest in this new element, and it is with pleasure that I follow the suggestion of SCIENCE to write an article on this subject.

(1) INTRODUCTION

The existence of an element between thorium and uranium was predicted in 1869, with the genesis of the greatest generalization of chemistry in the last century—the periodic system of the elements of D. Mendeléeff, whose centenary of birth is now being celebrated.

This element—*ekatantalum* in Mendeléeff's nomenclature, or *Element 91,* according to its number in his system—is now represented by three natural radioactive atomic species or isotopes, to which very recently one, or perhaps two, artificial radioactive species have been added (see Table I).

Chemically, all these species are indistinguishable and behave absolutely alike, so that the chemical properties of Element 91 can be inferred from any one of them; their radioactive or nuclear properties, however, are widely different.

The first representative of Element 91 was discovered in 1913 by K. Fajans and O. Göhring in the form of the rapidly decaying *brevium,* with an average life of its atom = 100 sec. All other isotopes of ekatantalum have also a very short life and are characterized by the emission of negative electrons, with the exception of protactinium which emits -particles, and which is the most important because of its long life.

It was in 1917 that Frederick Soddy, the distinguished pioneer in radioactivity, in collaboration with J. A. Cranston in England and simultaneously and independently O. Hahn and L. Meitner, the leading radiologists in Germany, obtained preparations which gradually transformed into actinium and discovered new alpha rays, which could be due only to a new isotope of Element 91, subsequently named protactinium, present in great dilution in their material.

During the following 10 years all efforts to obtain and isolate the very rare protactinium were unsuccessful, owing to wrong chemical properties being attributed to it, and until 1927 nobody actually saw it or any of its pure compounds. It was generally thought that Element 91 resembles tantalum, just as radium resembles barium; since the latter are always associated in analytical operations, attempts were made to isolate protactinium by adding tantalum to the raw material and extracting them together.

We have to expect, however, for Element 91, according to the periodic law, besides properties similar to tantalum and columbium, also other *individual* and *characteristic* properties, *differing* from its analogues, which should simplify the isolation of the element. Basing himself on these considerations, the writer had the good fortune of extracting in 1927 in pure form the first two milligrams of the pentoxide of protactinium—Pa_2O_5; we attribute this result solely to the great guiding force of Mendeléeff's principle.[1]

In 1928 a technical process of extraction was worked out, and thanks to the help of the I. G. Farbenindustrie A. G. about one half a ton of radium residues could be worked up at their factory in Ludwigshafen on the Rhine and about 40 milligrams of Pa_2O_5 were obtained. From then on our efforts were concentrated on the production of larger quantities of the element for the study of its properties.

(2) CHEMICAL PROPERTIES OF EKATANTALUM AND ITS COMPOUNDS

Mr. M. Agruss and the writer[2] have recently obtained over 0.1 gram of protactinium oxide (see sec-

[1] A. V. Grosse, *Nature,* 120: 621, 1927; *Naturwissenschaften,* 15: 766, 1927.

[2] A. V. Grosse and M. S. Agruss, *Jour. Am. Chem. Soc.,* 56: 2200, 1934.