

INFRASTRUCTURE: ETYMOLOGY AND IMPORT

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ABSTRACT: As attention to the nation's infrastructure becomes a matter for political discussion, there is also a focus on the word itself. The funding formula will depend upon definition, and a review of the etymology is in order. The word is traceable to NATO war mobilization studies in the 1950's and to the economic development literature of low income nations shortly thereafter. Gradually it came to be used for capital investment of all sorts—human capital as well as physical plant investment. With so diffuse a meaning, the term tended to drop into disuse. Now in the 1980's we see a revival in the use of the term, with a likely repeat of its evolution as discussion develops over resource allocation to such legitimate claimants as transportation facilities, flood control, water and sewer facilities, health, education, and other public sector responsibilities.

New York State Commissioner of Transportation James LaRocca, speaking before members of the American Society for Public Administration on May 3 of this year, expressed regret that there was not a better word than infrastructure to describe the collective public investment of roads, bridges and other appurtenances to be addressed by the state's proposed bond issue in 1983. The word seems to have sprung into public discourse only about two years ago with many wondering where this monstrous neologism could have come from.

The fact is the word infrastructure has a history in the English language going back some thirty years at least, and perhaps even longer elsewhere. It is worth examining what traditional usage as well as confusing baggage the term carries with it in our deliberation over whether to keep it or cast it aside in preference for some other.

A quick review of its etymology suggests an apparent clarity to the term. The Latin root *infra-* has the various meanings of below, under, within, between, and even, on occasion, after. 'Structure' is suggestive of any artifice of unnatural origins. One might induce from these roots a meaning such as that element of capital overhead which is supportive of all other economic investment in a society, necessary to its further development. But like many words sprung forth almost full blown, there have been subtle variations in its use and debate about its presuppositions almost from the beginning. The word is not included in Webster's Second Unabridged (19), but is included in the Third (20). It is nowhere to be found in the 1933 Oxford English Dictionary (15), but does appear in the 1976 Supplement (16). Clearly it is of recent vintage.

Other specialized dictionaries give further explication of the word. Most dictionaries of economics include it (1,3,6,7,11,13) as does the International Encyclopedia of Social Sciences (2), and one particular dictionary of economics (11) directs attention to military parlance. These sources

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taken together give a rather detailed picture of how this word has evolved in the course of some thirty years. They also give the suggestion of a growing appreciation of capital expenditure and resources to the general strength of a society.

MILITARY AND ECONOMIC DISCOURSE

The earliest use documented is in 1927 in the Oxford English Dictionary, wherein the term was used to describe "the tunnels, bridges, culverts and 'infrastructure' work generally" of French railroads. The next frequent appearances are in connection with NATO war mobilization studies in the early fifties. Lord Ismay, first Secretary General of NATO, published a volume in 1954 which devoted a whole chapter to "NATO Common Infrastructure," which referred to all of the "fixed installations which are necessary for the effective deployment and operations of modern armed forces." Ismay also alluded to its French genesis, and used the word in quotes in recognition of its recent coinage (10). Military tracts and dictionaries were making distinctions between national infrastructure, bilateral infrastructure, and common infrastructure, in consideration of the source of funding and administration of those capital investments thought necessary to a secure defense of Europe. Consistent with military precision, the armed forces dictionaries defined the terms with appended initials to indicate its authorized use for the U.S. Army, Joint Forces, NATO, SEATO, CENTO, and presumably nowhere else (18).

Ismay's report gave clear and thorough accounting of what infrastructure inventory was thought relevant to military needs, as well as its precise monetary value. The inventory included not only highways, bridges, tunnels, railroads, canals, airports and other transportation installations, but also communications facilities, power, irrigation and flood control facilities, warehouses and other storage depots, and even fuel and spare materials and parts essential to sustain a military defense. Clearly whatever general economic and civilian benefit such investment might have was subordinate and even extraneous to the predominant military thinking. To many, the word infrastructure was a military term employed by strategic planners and defense experts involved in the cold war activities of NATO and our other alliances.

At the same time, however, the term was making its appearance in another area altogether, in the emerging academic discipline of economic development (8,9,12,14,17). Here the concern was less one of defending borders than of national development, particularly of low income nations. There came the quick recognition that social and political development rested very much upon economic development, and the critical lack in many societies was the capital base upon which a modern industrial society might flourish. U.S. AID officials and academics who offered theories to support national development appropriated the term in ready recognition of its place in economic growth.

That capital investment which was most readily needed for the further development of heavy industry, trade, and nation building itself came to be called infrastructure development. Most importantly, it was understood that this investment was one where the government necessarily

had to play a large role. In the absence of an effective national government in many such 'underdeveloped' countries, American capital was perceived as the natural and logical source of support. To the extent that it was understood to be in the American national interest to have strong and stable governments and developing economies in these nations, infrastructure development was seen as an American challenge. As Europe grew stronger its participation in such development was also expected to grow.

By 1960 the word had gained sufficient academic currency that it was no longer defined with each use or put in quotations. There was general agreement that modern war mobilization required the prior preparedness of an awesome capital investment. At the same time there was agreement that economic development, particularly of the countries of Asia, Africa, and Latin America, to which the western powers were committed to aiding, needed huge investments in a material infrastructure before the threshold, or "take-off," of economic development could be expected. There was recognition in either case that, because of the high initial costs and long payoff period of such investment, government played an inordinate role. Yet because of the diffuse benefits which such investment offered, it was difficult to establish the exact level of public involvement needed, or the strategic placement, or even the timing. Usually, officials pleaded the lack of adequate resources. Yet some economists went so far as to warn that "the building of infrastructure can be overemphasized, and that perhaps, after a minimum amount of infrastructure has been constructed, investment funds could be better utilized in productive activities" (7).

ECONOMIC DEVELOPMENT STRATEGIES

The shift in interest from military defense to economic development led to evaluation of various investment strategies. Grand designs encompassing whole social systems were proposed that would lift impoverished nations from their status within a matter of years, these defined in clearly outlined timetables! Debates flourished over whether investment strategies should be surgically precise or general, time delimited or sustained, addressed to specific economic sectors or to whole social units. One particularly esoteric debate concerned the merits of what was called "balanced" as opposed to "unbalanced" growth (9). In the meantime, the concern with national economic development, and the evident success of European development in comparison, led to a realization that far more than material investment was involved in successful modernization strategies. Investment needed to be not just in roads, airports, and water systems, but in the training and education of human beings. Suddenly the challenges of health, education, and social organization loomed equally large, and these too were proposed as part of infrastructure development. The word, it seems, was losing its conceptual rigor.

Economic understanding of the challenges of socio-economic development, however, grew much more sophisticated and realistic, and with this growth of understanding came a decline, almost a demise, in the use of the word infrastructure. Replacing it was the term "social over-

head capital," the word most recently associated with this arena of discourse among economists. This was further refined to distinguish economic overhead (i.e., physical facilities) and social capital (human investment) (2,11). The economic examination continued along the lines of strategies to optimize development by the appropriate level of public investment. And the complexity of the effects of investments made the notion of specifically addressing one sector or another of the economy almost impossible. If anything, recent attention has focused upon human development more than physical plant development, perhaps as a consequence of the disillusionment with initial visions.

INFRASTRUCTURE ANOTHER TIME AROUND

The recent revival of the term infrastructure in American political discourse comes at a time when some of the same conditions remain as were first observed in third world nations thirty years ago. There is the slow rate of economic growth, the high rate of unemployment, the shortage of capital, and a workforce insufficiently trained to meet the needs of industrial expectations. There are also significant differences. There is already in place a serviceable, even if inadequate, infrastructure investment. There is a considerable capital base elsewhere in the economy on which to begin rebuilding, and lastly, there is a recognition of a challenge to be faced by the public. Much of the call today is not for investment in new facilities but for adequate and renewed maintenance of past investment. Infrastructure today is the shorthand term used for public sector physical plant.

To the extent that the concept has penetrated the public consciousness, this lesson at least has been learned: physical plant, whether private or public, needs continued care and maintenance. Even the successful television ad for car care, "pay me now or pay me later," is evidence of the fact that the American public now generally understands the concept of preventive maintenance. What needs to be brought home is the contrast between this requirement and what is in most cases being performed now, demand maintenance. Filling the pothole after the road is substantially deteriorated, in contrast to a periodic resurfacing after a given number of years, may conceivably be the most expensive of alternatives. The cleanup of toxic materials after they have been discarded and dissipated through a water system is many times more expensive than precautionary storage and elimination initially. The fact that these points are now so clearly understood by so many is testimony to the growth of awareness of the American public. Twenty years ago the point probably would have been lost. The hue and cry for infrastructure renewal comes not just from expert engineers and scientists, but from the general public inconvenienced by the effects of deteriorated services.

Still, the debate has once again taken on the color of arguments heard twenty years ago over the meaning of infrastructure, or social overhead capital. This is because there is concern once more about regenerating economic growth through physical plant maintenance and renewal concurrent with concerns about the needs of educational quality and other direct human services. Once more we are witnessing a severe and earnest competition over available resources to address directly human needs

as against physical plant facilities needs. Shall we expend our marginal tax dollars on transportation, sewers and water systems, or would it better go to education and training for the high tech society so that we can better compete industrially with other nations? The economic development debate seems to have come full circle, this time not in reference to countries of Africa and Asia, but for us right here at home. Infrastructure, or social overhead capital; the definition of each seems again up for grabs.

There was a time when political scientists debated the extent to which a central government administration could maintain legitimacy and hegemony over a nation's population, observing that the key variable was the national infrastructure. Here was meant not only communications and transportation facilities, but police, bureaucracy and so on. To carry this usage to its extreme, during the Vietnam war, military strategists devised ways of destroying the infrastructure of the enemy. By this was meant not elimination of the physical facilities of the Viet Cong (there were none), but the organizational support upon which the insurgency depended.

General Vo Nguyen Giap's metaphor was that the guerrillas were like fish in the sea of a generally supportive population of civilians. (Thus arose the American answer, to "dry up the sea.") There has been little use of the word in this guise since.*

CONCLUSION

The narrower definition, that is used only for physical facilities, seems to be prevailing in the resurgent use of the term. We speak now of the fixed investments that need maintenance, an infrastructure investment already in place, which, if allowed to deteriorate, would be irreplaceable. Infrastructure is the undercarriage of the American economic and social system, like the city beneath the ground necessary to its support but which is less often seen. We are beginning to notice the visible portions, roads and bridges and dams, that are so much a part of our national wealth. Having come to understand the place of these investments to our total national well-being, we may come also to understand the equivalent position of water and sewer systems. The public discourse has evolved quickly in a short time, and appears to grasp the extent of the problem facing the nation.

Still, the public has yet to develop a comprehensive and clear strategy to deal fully with infrastructure deterioration, or for that matter with future maintenance needs. There is little doubt, however, that a better conceptual understanding of the component relationships of American society has come about in a short period of time. Whether it be attention to material or human resources, capital investment seems to be once again a high priority, and there will be heightened competition for pub-

*On June 8, 1982, the term was used in still another sense by President Reagan in London before the British Parliament. In a speech entitled "Crusade for Democracy," the President spoke of the need in third world nations to foster the infrastructure of democracy—the system of a free press, unions, political parties, universities—which allows a people to choose their own ways, to develop their own culture, to reconcile their own differences through peaceful means (*New York Times*, June 9, 1982, page A16).

lic resources in each of these sectors. The full consequences for American political ideology are yet to be felt, but it may be now only a matter of time before Americans come to understand that our society is very much a whole system, and that, like the ecologists have said, "everything is connected to everything else." We have already had demonstrated the other major truth they had to offer: "there is no free lunch."

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