4. ELEMENTS OF SPATIAL PLANNING: THEORY. PART I.**

SANDRA L. ARLINGHAUS

One reason that planning of any sort is a difficult process is that it involves altering natural boundaries to fit human needs and desires. While it may not be "nice to fool Mother Nature" the act of planning may be predicated on such an attempt, especially when the balance between human and environmental needs is tipped strongly toward the human side. At a very general level, planning how to use the Earth's surface involves what space to use and when to use it. The "what" issues are those that involve spatial planning; they typically involve the concept of scale. The "when" issues involve temporal planning; they typically involve the concept of sequence.

Particular spatial issues might address whether or not boundaries of a parcel of land are clearly designated with respect to one's neighbors; whether or not a proposed land use is consistent with the general character of a larger region; or whether or not a developer's site plans give sufficient attention to natural features. Temporal issues might address the long range and the short range view of a traffic circulation pattern; the sequence, in years, in which lands are to be annexed to a city; or the length of time trees need to have lived in order to be designated landmark trees. When one considers that budget concerns often function as an underlying factor that can help to sway this balance, the fragility of the art of planning becomes apparent.

One way to view complicated issues is to consider them at an abstract level in order to understand the logic that links them. The two-valued system of logic on which much of mathematics is based offers one structure that exposes logical connections. When using this structure in conjunction with real-world settings, which often defy the Law of the Excluded Middle, one generally has a number of difficult decisions to make; it is in the act of making these decisions that thoughts can become clearer.

WATERSHED PRINCIPLE

The preservation of natural features is an issue that can be a developer's nightmare, just as development can be the bete noir of the environmentalist. When man-made boundaries are superimposed on the natural environment, there is often little correspondence between the two partitions of space. Abstractly it is not surprising, therefore, that individuals using one way to partition space will be at loggerheads with those using a different partition of space.

When the topography of a region is altered, it is necessarily the case that the natural features on that surface are also altered. Considering the contrapositive of this statement, a logical equivalent, leads to the idea that the preservation of natural features is dependent on the preservation of topography. When this idea is coupled with the notion that the fundamental topographic unit is the drainage basin or watershed (Leopold, Wolman, and Miller, Fluvial Processes in Geomorphology), the following principle emerges.

Watershed Principle.

If the preservation of natural features depends upon the preservation of topography and if the fundamental topographic unit is the watershed, then the preservation of natural features depends upon the watershed.

If one accepts this Principle, then it may well be a small step to the following Corollaries.

Corollary 1.

When environmental concerns are involved, the drainage basin should be the fundamental planning unit.

Corollary 2.

When the drainage basin is the fundamental planning unit, the partition of wetlands and other elements of the drainage network, by man-made planning unit boundaries, is not possible.

Decisions as to the impact a proposed development project will have on a wetland are facilitated by having the entire wetland contained within the legal boundaries of the parcel; using the drainage basin as the fundamental planning unit ensures that such set-theoretic containment will be the case. Issues involving the welfare of the entire watershed also become tractable under such an alignment: neighbors become neighbors with respect to the drainage pattern rather than with respect to superimposed human boundaries. Indeed, what my neighbor does three miles upstream from me may have far more impact on my land that does the action of a neighbor 100 feet away who is in a different drainage basin. Current technology (Geographic Information Systems, for example) might make it possible to alter the inventory of lands to create suitable, substantial changes, along these or along other lines, in legal definitions. The use of technological capability to make legal definitions correspond more closely to natural definitions can lead to the resolution of conflicts: the closer the fit between natural and man-made boundaries the fewer the disagreements.

MINIMAX PRINCIPLE

The basic idea behind the Watershed Principle might be captured as one that minimizes damage to the environment and maximizes satisfaction of human needs and desires. Viewed more broadly, the Watershed Principle might be recast as a MiniMax Principle which can then be recast downstream abstractly, in a number of other more specific forms (such as the Watershed Principle).

MiniMax Principle

An optimal plan is one which minimizes alteration of existing entities and maximizes the common good.

Highly general principles, such as this one, demand attention to definitional matters: what is meant by "common good" or how might one measure "alteration." These are difficult

problems: one advantage to an abstract view is to bring important and difficult issues into focus.

EARTH-SUN RELATIONS: GEOGRAPHIC COORDINATES AND TIME ZONES.

One case in which the fit between natural and man-made boundaries is done in a style consistent with the Minimax Principle is the spatial layout of reckoning time (thus, time becomes transformed in a "meta" fashion into space). Much of the developed world measures the passage of time by the position of Earth relative to our Sun. One unit of time, the year, corresponds roughly to one revolution of the Earth around the Sun. Another, smaller, unit of time, the day, corresponds roughly to the rotation of the Earth on its axis--the man-made boundaries in both cases are set by the natural planetary motions in space.

When planetary motions do not permit any further refinement of the day into even smaller units, we subdivide the day into hours. When the partition of the day into 24 hours is put into correspondence with the grid system based on latitude and longitude, one hour corresponds to fifteen degrees of longitude. Fifteen degrees of longitude corresponds to a central angle of fifteen degrees intercepted along the Equatorial great circle. Thus, 24 man-made time zones of 15 degrees of longitude each envelop the Earth--man-made boundaries again follow (although a bit indirectly) from natural boundaries. The Earth becomes a "clockwork orange" of 24 sections, each 1 hour wide, with boundaries along meridians spaced 15 degrees apart. Across oceans, this alignment of time-zone and longitude may reasonably have boundaries along meridians; interior to a continent, however, human needs and desires may reasonably prevail, making it prudent to bend the natural alignment for the common good.

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