Site Adaptive Planning and Design

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Conventional Development Planning: For new development projects, communities require the developer to submit a site plan which is reviewed to ensure compliance between the local zoning regulations and other regulations such as wetland or woodland preservation ordinances/bylaws. Most site plan reviews are performed by committees or planning commissions consisting of laypersons. In those communities with a planning staff, a professional urban planner will also review the site plans; otherwise, a planning consultant is hired to provide the review. After these experts review the plan, they present their findings to the citizen committee for final review. Developers are also present throughout the process to respond to questions, make public presentations if required, and finally to revise the plan to gain compliance.

This sounds like a good approach. You have generalists from the public, representing community interests, who bring a different perspective to the table than the professionals whose responsibilities are mainly technical. And, if there are any problems with the proposed plan, they can be fixed by the developer working in consultation with the community and its political and professional representatives. The real problem here is not with the process of project review, but in the means, or the methodology, used to actually formulate the development plan and site design.

Most subdivision planning and development in North America is based on land use density as specified by zoning. In most communities all lands are given a zoning designation, and for those areas zoned residential, the developer is limited to a specified number of units as well as certain lot sizes and types of housing. For example, local zoning regulations may limit gross density in a particular area to an average of one unit per acre with no lot smaller than 0.5 acre. Thus a 50-acre site can be planned for 50 homes, but because of the lot size limitation, the houses have to be spread over the entire site. Although there may be additional restrictions imposed on the developer related to wetlands and floodplains, there

is usually no consideration given to matters such as landscape hydrology including the location and role of the proposed development site in the local watershed and how the development might influence local runoff patterns, groundwater recharge, and water-related plant and animal habitat. The configuration of the resultant subdivision design looks pretty much like every other subdivision with that zoning designation simply because the community failed to ask the developer to do anything more than comply with zoning and go through a review process.

The problem with this approach is evident. It treats a naturally diverse landscape, with all sorts of different hydrologic, geomorphic, and ecological functions, as a level and uniform playing field, essentially a zoning sandbox. As a result, subdivisions keep getting built on land either poorly suited for development, such as areas with soggy soils, unstable slopes, high water tables, and prized habitats; or on land differentially suited for development in which some parts of the site should have no houses while other parts should have tight clusters of many houses; or on land with some kind of constraint such as a seasonally high water table using landscape, architecture, and engineering designs appropriate constraint-free sites.

Site Adaptive Planning and Design: To remedy this situation we first have to agree that our North American landscapes are inherently diverse and that this diversity is functionally meaningful, that is, biophysical diversity reflects the way the landscape actually functions in terms of water flows, plant and animal growth and movements, the flow of air and radiation, and so on. To discover the diversity of a proposed development site, it is first necessary to carefully examine its landscape. This process begins with mapping the soils, vegetation, slope, drainage, sun angles, and other phenomena including the artifacts of past land uses. The next step is to translate these data into information meaningful to the developer, the community, and the sustainable management of larger environmental systems such as watersheds. And the third step is to design a land use plan that responds to the true character of the land, not just its features but its processes and how it all fits into a larger working whole, that is, into a system such as a watershed.

We call this approach *site adaptive design*, and in most places it should yield development plans that vary appreciable from place to place in response to the varied character of the terrain. This variation in the way we design should, among other things, take the form of different lot sizes, lot shapes, road widths, housing densities, housing types, and open space within a large development site. In this way land use facilities can be designed to fit the land and its systems, especially drainage systems. The alternative, zoning-based development planning, tends to treat all land types alike irrespective of how they function in the watershed. It is an approach that ignores opportunities inherent in every landscape to let nature do its job of absorbing water, regulating runoff, maintaining swamps and woodlands, and feeding streams, and thus denies us privilege of building truly sustainable communities and landscapes. And when we deny ourselves access to these natural services, we must, at great expense, replace them with manufactured ones, for the landscape, our facilities, and our communities cannot function without them.

Towards Smarter Growth: For the past 50 years or more residential development in North America has been governed by the automobile. Efficient traffic flow has been the chief design objective of residential planning and virtually anything, such as stormwater or bicycle traffic, that threatened to get in the way was discouraged, outlawed, or engineered away. From the driveway to the expressway, suburbia has by design become the kingdom of cars.

This in turn has given rise to neighborhoods that do not function very well as communities. Among other things, they do not provide accessible services such as stores, restaurants, and schools and they do not foster the types of social relations among neighbors that build a sense of community because walking, bicycling, and other street-oriented activities are discouraged by the wide streets, fast traffic, and front yard garages connected directly to the street. Neither do they function very well as part of the environment for the entire landscape of suburbia is made up of concocted forms and features. Virtually nowhere are natural systems or their vestiges to be found. Lawns and exotic shubbery have replaced forest ecosystems and curbs, gutters, and storm drains have replaced the natural swales that both absorbed runoff and carried it to local streams while creating a taste of local nature.

The search for an alternative form of suburban development is driven by two objectives. First, to design neighborhoods that function as communities, and second, to design them with an eye to the local landscape, that is, to practice site adaptive design. Watershed management is central to the second objective and here the idea is to come up with design schemes that first result in significantly less stormwater and second dispose of the remaining water in ways that do not require the elaborate structural facilities of the pipe and pond approach.

As it turns out, both the community and the environmental objectives are complementary, for among other things, both can be satisfied to a great extent simply by downscaling residential development. This means building smaller streets and increasing density by placing houses on smaller lots with less impervious surface per household. (Higher densities reduce per capita stormwater production.) It also means changing the philosophy of stormwater management from one of exporting rainwater to one of on-site disposal of rainwater, that is, one that uses source control measures such as those employed by Portland, Oregon. These include various devices such as infiltration beds and dry wells in yards and rain gardens along parking lots, parkways, and parks, all of which are aimed at getting water into the ground. And beyond individual properties, neighborhood streets are lined with shallow, grass-lined swales that pick up road runoff and conduct it slowly along while promoting infiltration through the swale floor. Overhead are street trees which intercept rainfall and thereby reduce its volume and rate of delivery while their root systems draw on infiltrated water and release it into the atmosphere. All these measures fall under the general heading of *green infrastructure*. The combination of green infrastructure and downscaled neighborhoods not only reduces the total output of stormwater, but also reduces by as much as half the total the cost of residential infrastructure.