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ROTTERDAM ROOF PARK: A MULTIFUNCTIONAL STRUCTURE OF SHARED USE
DEFINING FOUR SPATIAL DIMENSIONS OF MULTIFUNCTIONALITY

In the context of urban planning, concepts of multiple land-use refer to situations where the existing space is more intensively used (Habiforum, cited in Hoornweer et al. 2001). This can be achieved by morphological integration of functions (stacking of multiple functions in one building or construction), by mixed space use (multiple functions in a certain defined area) and by temporal shared-use of the same space.

The degree of spatial integration we use is based upon a classification by Ellen (2011) and adapted by Van Veelen (2013), who distinguishes four spatial dimensions of multifunctionality. These dimensions are used for evaluating the degree of spatial and functional integration, with slightly adapted terminology (see also Figure 5).

1. Shared use
A flood defence structure is (temporarily) used by another function, without any adjustments to its basic structure. It is, generally, well possible to use the flood defence for infrastructure, recreation and agricultural uses, as long as the functioning of the flood defence is not impeded.

2. Spatial optimisation
The basic shape of the flood defence is adapted to create space for other structures. These structures are technically spoken not part of flood defence structure. Spatial optimisation is found in many places in the highly urbanised areas of the Dutch delta. The most compact and spatially optimal shape is obtained if a vertical retaining wall is applied which replaces a dike slope or berm, leaving space for, e.g., housing.

3. Structural integration
An object is built on, in or under the flood defence structure, but does not directly retain water. The concept of structural integration is used in situations where the current dike is over dimensioned (super dike) or many times stronger than necessary (concept ‘unbreakable’ dike).

4. Functional integration
The water-retaining element of the flood defence also functions as a part of the structure with another function (the object). Although this concept is technically feasible, it is hard to find realised examples of full integration.

The determination of the degree of integration starts with identifying the composing elements of a flood defence structure.

- As a first step it should be determined whether an element has a water-retaining function or influences the strength and stability of the flood defence structure as a whole.
- If this is not the case, the integration is categorised as ‘shared use’, as long as the basic shape of the flood defence is not altered.