

of the city of Amsterdam. It has been demonstrated that the rainfall of the sand dunes of Holland is greater than that of any other portion of the country. The balance of pressures between the freshwater zone and that of the underlying salt-water zone has to be carefully studied, as should the freshwater seal be broken by severe pumping at great depths, the water supply of Amsterdam would be imperilled.¹

The freshness of the water and its inexhaustible amount are of importance to the subject-matter of the next section of this chapter, in that fear of water exhaustion in planting up beaches need not be entertained; whilst, as the majority of wild beach plants are non-halophytic, a vastly wider range of plants is available for selection than would be the case if tolerance of salt water were a necessary condition.

The Planting of Shingle Beaches.—The object considered here in planting beaches is that of retarding or arresting the landward movement of shingle spits and other similar formations. The function is perfectly analogous to that discharged by Psamma on a littoral dune, except, of course, that the materials are wind-borne in the latter case.

In what may be termed a normal case the beach is liable from time to time to overflow by storm waves, so that shingle is thrown over from the face, or the crest is lowered, and the shingle carried down the slope to the leeward edge (as illustrated, for instance, in fig. 22, p. 95, and fig. 28, p. 109). Protection such as we contemplate is required in the case of beaches, the landward advance of which is liable to obstruct navigation or drainage channels, to drift over reclaimed marshes, as well as in the increasing number of cases in which municipal works of various kinds have been erected on the beach itself on account of cheapness of site, or where residential "bungalow towns" have sprung up in obedience to the modern demand for fresh air and "the simple life". It will be understood that the protection by vegetation considered here is solely from on-shore gales. The control of the along-shore drift of shingle, on the other hand, lies at present outside the province of the maritime

¹ "The Winning of Coastal Lands in Holland" (A. E. Carey), *Proc. Inst. C. E.*, Vol. CLXXXIV, pp. 1-73.