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REPORT

ON

THE EMBANKMENTS

OF THE

RIVERS OF BENGAL.

BY ORDER OF THE DEPUTY GOVERNOR OF BENGAL, DATED 14TH AUGUST,

1846.

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SECTION I.—EFFECTS OF MOUNTAIN STREAMS, AND HOW THEY SHOULD BE COUNTERACTED.

BEFORE the questions offered for the consideration of the Committee, by Government in No. 562, of the 14th of August last, are dealt with, it may be necessary to observe, that all rivers overflowing their banks, and carrying silt and sand in their waters—and this embraces almost all mountain streams—have their margins, and the tract of land contiguous thereto, higher than the surrounding country, and hence, during unusual floods, or freshes, the escaping waters have lodged on the lowest lands, and there being no outlet, have reduced them to swamps.

2. As we cannot suppose the margin, and adjoining land should be raised, and the bed of the river deepened, or that one portion of the stream should carry alluvion, and not the other, we must receive as a fact, that wherever the waters of these mountain streams reach, the matter held in solution, together with sand, &c. proceeding from the degradation and denudation of rocks, and the erosion of the streams, on their banks, is deposited ; causing a rise in the bed of the river itself, as well as in the margin of the stream.

3. This being the effect produced, the system of bunding rivers, whether with the intention of contracting, or extending, their sections, must accelerate this process, in the proportion, the section from bund to bund, bears to that of the natural inundation. The quantity of silt in the stream being the same, its depth when deposited will depend on the space it is allowed to expand over, and hence rivers with embanked margins, are more rapidly raised above the level of the country, than others possessing a more extended section.

4. In Italy we have striking proofs of the truth of this theory in the Adige, the Arno, and the Po, the beds of which are much higher than the countries through which they run, and hence if the bunds of those rivers were to give way, the course their streams might then take, it is impossible to surmise, or what would be the probable amount of injury they might inflict on the country.

5. Such being the case, the most obvious plan to have prevented the beds of mountain streams from being silted up, would have been to draw off their waters during the freshes, and carry them with their silt in solution, to make their deposit in the lowest levels of the neighbouring districts, by which the silting up of the bed of the river would have been retarded, and the low lands, in the vicinity of either bank, elevated.

6. It may be urged that this system by not allowing the freshes to act on the margins of the rivers, would cause the bed of the stream to silt up, while the banks remained at their usual level, and thus the freshes would have a diminished section to flow in every year, but this will only, we imagine, act for a short time, and in a very slight degree; because it will be evident, that the greater the quantity of water, withdrawn into the country, the less depth will there be, from which

deposits can be given to the bed of the river, and although this last will have its level slightly raised, while the margins remain the same, yet this will be in an infinitely less degree, than while the height of the silted up bank retained a greater quantity of water, from which the silt was deposited.

7. We would therefore suggest that instead of applying bunds, (to increase an evil, which each year becomes more formidable, *i. e.* silting up more rapidly the bed of the river, and when the bunds are breached inundating the whole country,) the margins, or silted up banks, should have been cut through, so that when the freshes came down, and the river rose above the cuts, the water would have flowed gradually into the country, and it should have been led, either by natural, or artificial, channels, into the lowest and most swampy parts, which would then have been silted up first.

8. The gradual effect of this would have been, (while the level of the margins of the river remained the same, and that of its bed very nearly so,) to raise the whole country from river to river, and gradually bring it to the same level as the margins of the streams; when the waters would gradually become confined to their natural bed, and we should then, to prevent the renewal of the same state of affairs, have to obviate, or destroy, the formation of the bar at the tide-way, or rather at the same time the waters are carried into the low and swampy country, a Dredging Boat should be employed on the bar, at the tide-way, to loosen the silt the moment the tide ebbs, and this done constantly every ebb, would, we are of opinion, lower the bed of the river in the same proportion that the country becomes silted up, until at last nothing but the Dredging Boats in active use, every ebb, would be required.

9. It may be objected, that if the freshes of any river bring down sand, then to raise the low country with such a deposit, would be to destroy the cultivation, and this remark is just ; but the Bengal rivers do not always bring down sand ; every second or third year a deposit called by the villagers Pullee, is laid over the sand, and this forms the richest land they cultivate.

SECTION II.—ORIGIN OF BUNDS.

10. Having shown what would have been the most advisable plan to have adopted, to lower the beds of mountain streams, and to dispose of the alluvion in suspension, brought down by their freshes, it will not be out of place to enquire, how bunds came to be substituted, for an operation so simple. From the earliest date within our recollection, after the Dewanny of Bengal was made over to the Government of the East India Company, the "Pool Bundy" has formed a charge against the revenues of the State. Nothing appears to be more natural, than to throw up an embankment, for the protection of a tract of country, against the irruption of waters ; and it is easy to conceive that this means of protection would, in all cases, be resorted to instinctively by a people unacquainted with physical science. When such a practice became established, every inundation would naturally be connected with the breaking of a bund, and hence experience would appear to confirm the popular belief.

11. With regard however to embankments in general, there can be no question of their importance, in reclaiming tracts of land from the sea ; as practised extensively in many parts of Europe, but their utility in such cases depends entirely on circumstances ; as no one would think of raising bunds of sand, or of reclaiming open sea coasts, exposed to the action of a surf! Embankments are therefore chiefly had recourse to, in Europe, for reclaiming the rich silted lands in sheltered bays, over which the tides would otherwise spread for many miles. In these instances the material for their construction is generally a tough clay, which becomes hard and solid when exposed to the air, such embankments, in Europe, soon assume a permanent character, and as they are exempt from tropical rains, their circumstances must be altogether different from such works in India. But to return to the Bengal rivers.