Supplementary information:

1. The definitions of nodal factor (*f*) and nodal angle (*u*)

The nodal factor (*f*) and nodal angle (*u*) are integrated into the nonstationary tidal harmonic analysis model:

$$Z(t) = Z_0 + \sum_{i=1}^{I}(f_i A_i \cos(w_i + u_i) + f_i B_i \sin(w_i + u_i)), \qquad \text{(S1)}$$

where $Z(t)$ is the water level at time t and Z_0 is a constant value. The amplitudes h_i and phases g_i are defined as:

$$h_i = \sqrt{A_i^2 + B_i^2}, \mathrm{g}_i = \arctan(B_i/A_i). \qquad \text{(S2)}$$

2. The observed and fitted results of 18.61-year lunar nodal modulation for K_1 constituent

Four parameters (β_1, β_2, α_1, and α_2) using Eq. (5) to match the observed amplitude of the K_1 constituent during the Pre-AAP (1965–1990 in outer Lingdingyang Bay; 1965–1994 in inner Lingdingyang Bay) were used to estimate the amplitude during the Post-AAP (1991–2016 in outer Lingdingyang Bay; 1995–2016 in inner Lingdingyang Bay) at all HK, CW and SSW stations in January (Figs S1a, c and e) and July (Figs S1b, d and f), respectively. Subsequently, we used the same approach to fit the observed amplitude of the K_1 constituent during the Post-AAP. The observed amplitudes of the K_1 constituent at HK station during the Post-AAP were larger than those predicted using the calibrated parameters for the Pre-AAP in January. The gap between upstream (CW) to the downstream station (HK) became smaller, although the difference during Pre-

AAP and Post-AAP was slight in CW station, explaining the main reason for the substantial decrease in tidal amplification in outer Lingdingyang Bay. On the contrary, the observed amplitudes of the K_1 constituent at SSW station during the Post-AAP were clearly larger than those predicted using the calibrated parameters for the Pre-AAP. This was the main reason for the substantial increase in tidal amplification in inner Lingdingyang Bay since the gap between the upstream (SSW) to the downstream station (CW) became smaller. Concerning the variation in July, it could be seen from Figs S1b, d and f that the human interventions had did limited impacts on the tidal amplitudes of the K_1 constituent.

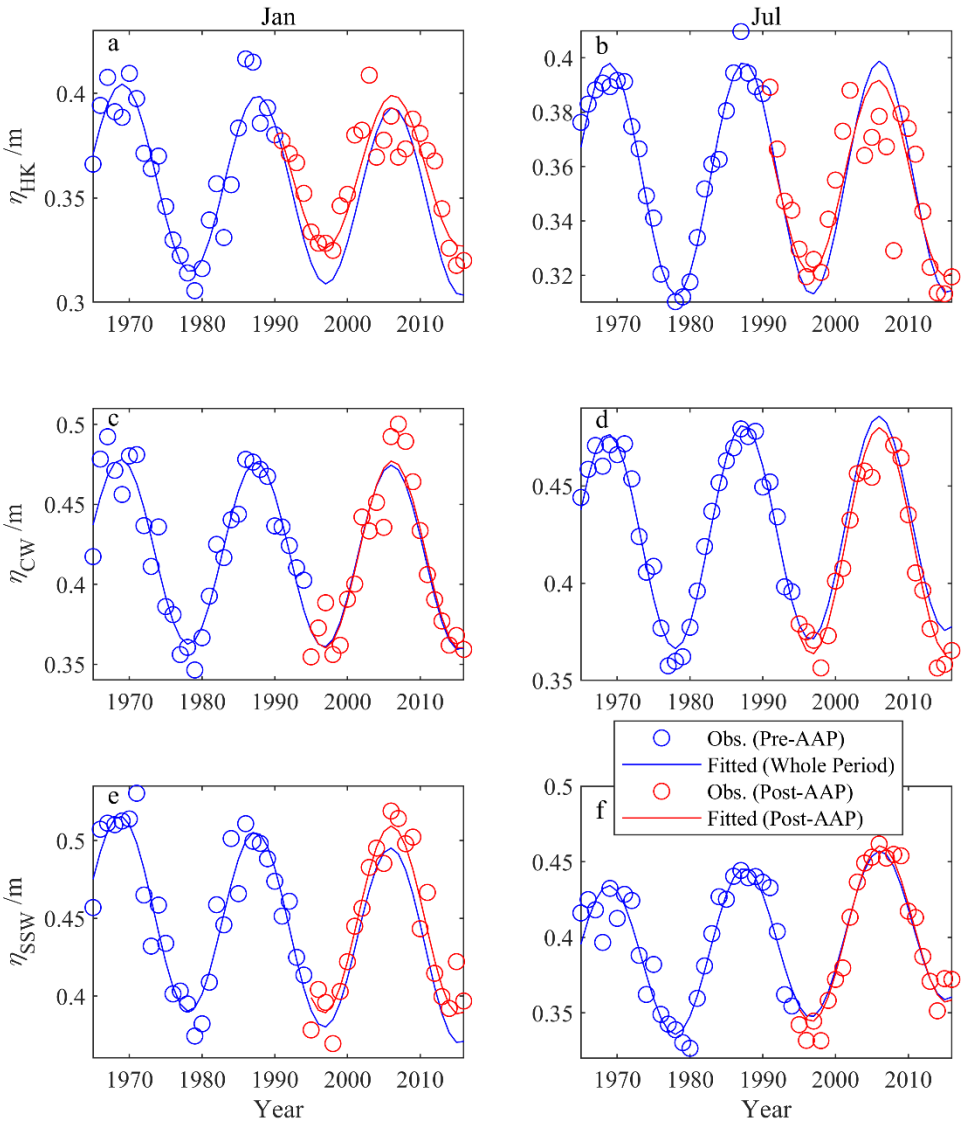

Fig. S1. Time series of tidal amplitude of the K_1 constituent in January (a, c, e) and July (b, d, f) at HK (a, b), CW (c, d) and SSW (e, f) stations. Blue and red hollow cycles represent the harmonic results during the Pre-AAP and the Post-AAP, respectively. Blue solid lines represent the best fitted curves of 18.61-year lunar nodal modulation for the whole study period using the calibrated parameters for the Pre-AAP. Red solid lines represent the best fitted curves of 18.61-year lunar nodal modulation for the Post-AAP.