## Realization of a piezoelectric quantum spin hall phase with a

## large band gap in MBiH (M = Ga and In) monolayers.

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Fig. S1 Band structures of (a) GaBi and (b) InBi calculated by PBE.



Fig. S2 Phonon spectra of (a) GaBi and (b) InBi.



Fig. S3 Phonon spectra of different modification sites.



Fig. S4 Band structures without and with SOC for GaBiH and InBiH calculated by HSE06 functional.



Fig. S5 The orbital evolutions at  $\Gamma$  point for (a) GaBiH and (b) InBiH.

![](_page_2_Figure_2.jpeg)

Fig. S6 The WCC evolutions and edge states for InBiH bilayer with A and B stacking configurations.