

Appendix C -Section C1

This section of Appendix C gives supplementary information on the climate data interpolation technique.

11-RCM data representing values on a 25km-resolution rotated grid (Figure 1) were acquired at a daily time step for the period 1950-2099 and recalculated into monthly mean values for accumulated temperature (AT) and moisture deficit (MD). Altitude data was overlaid and resampled, giving a mean value for each 25km cell (Figure 2). Combined with the cell centroid latitude and longitude, these sets of three values were input into a linear regression model to predict both the AT and MD for the 11-RCM data at eight decadal time steps (1970s, 2020s-2080s).

Figures 3-6 show a sample of the results from this interpolation technique. The regression-predicted value (x-axis) is plotted against the 11-RCM value (y-axis) with the deviation from the line showing the model residuals. Figures 3 and 4 show model 3q0 for the 2050s, showing AT and MD regression respectively. Figures 5 and 6 show model 3q3 for the 2080s, showing AT and MD regression respectively. The equations from the multiple linear regression analysis were then applied at a 250m resolution for every model at every decadal step for AT and MD.

This 250m data had to be calibrated to the interpolated AT and MD data used in ESC (for the baseline period), and this allowed a correction to be applied to all projected datasets. Due to the nature of the 11-RCM data, all baseline data is identical for the 11 variants. Because of the very large number of data points at a 250m resolution for GB, random-sampling was applied to get 1000 sample point paired values from the 11-RCM and ESC baseline datasets for AT (figure 7) and MD (figure 8). A linear regression was applied to these data and the output equation applied to each of the projected climate datasets.

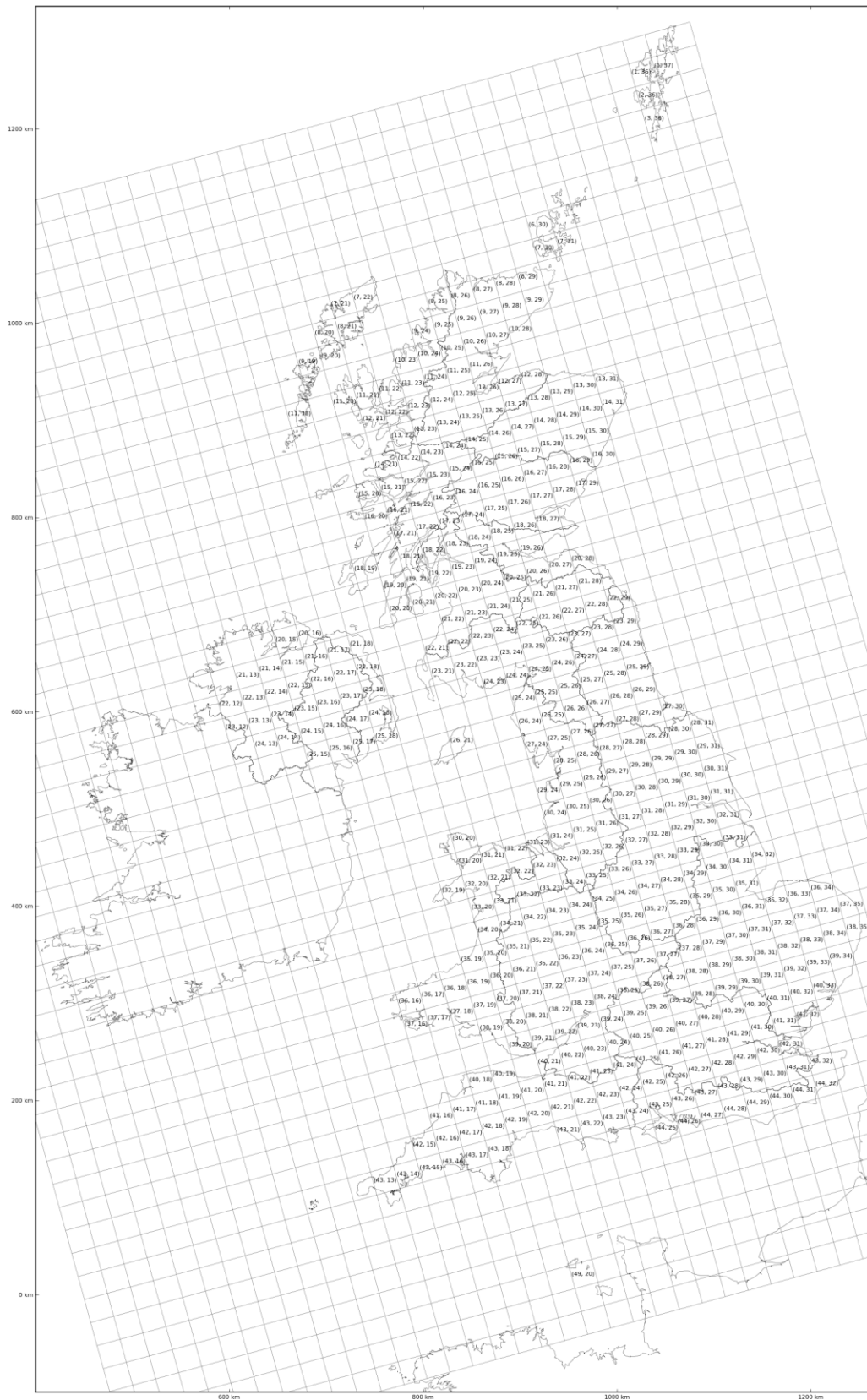


Figure 1. Cells of the UK Climate Projections rotated grid. Reproduced from the UK Climate Projections website: http://ukclimateprojections-ui.metoffice.gov.uk/ui/docs/grids/prob_land_25km_rotated/index.php

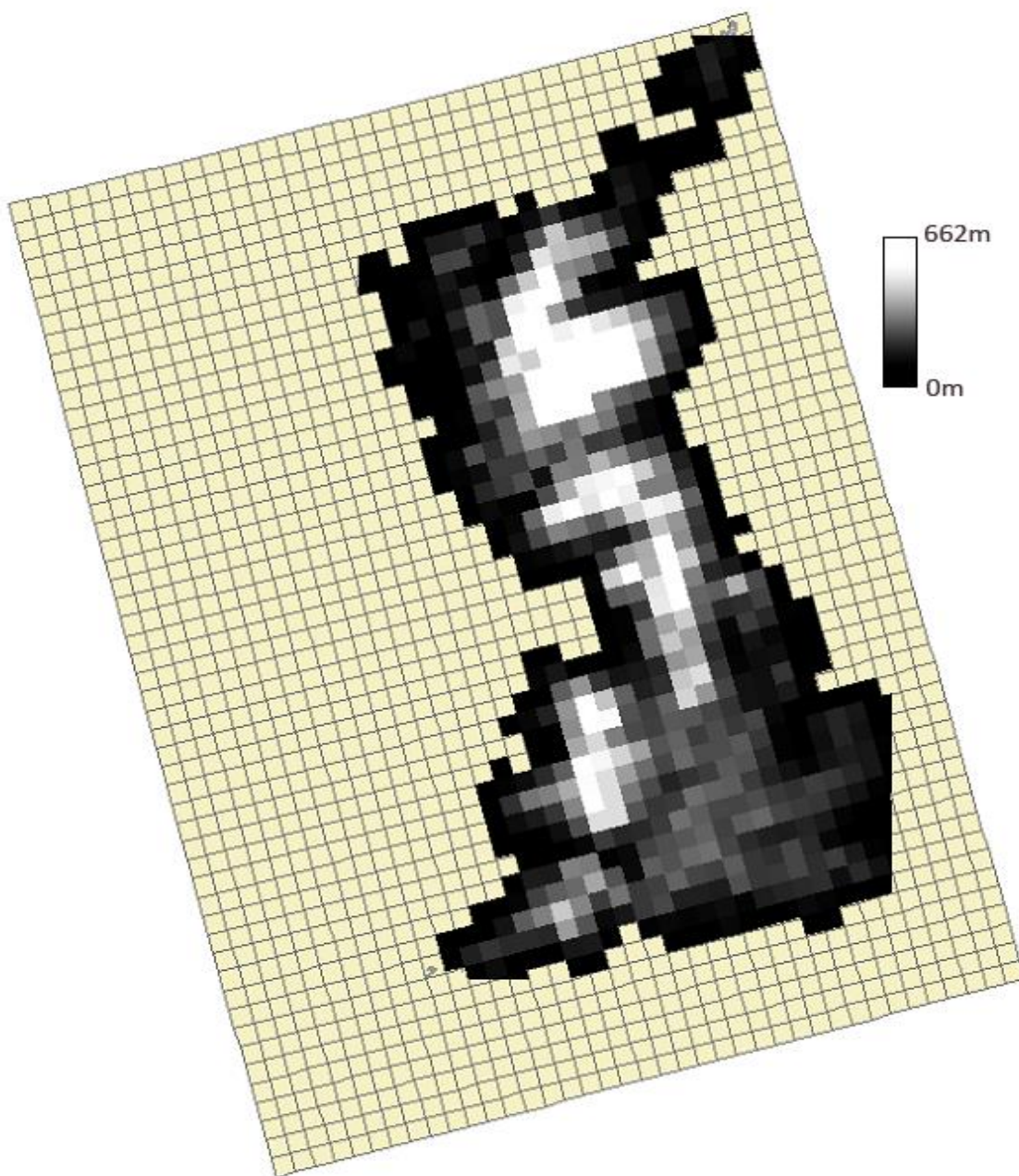


Figure 2. Mean altitude values for the UK Climate Projections rotated grid cells based on underlying 250m Digital Elevation Model (DEM).

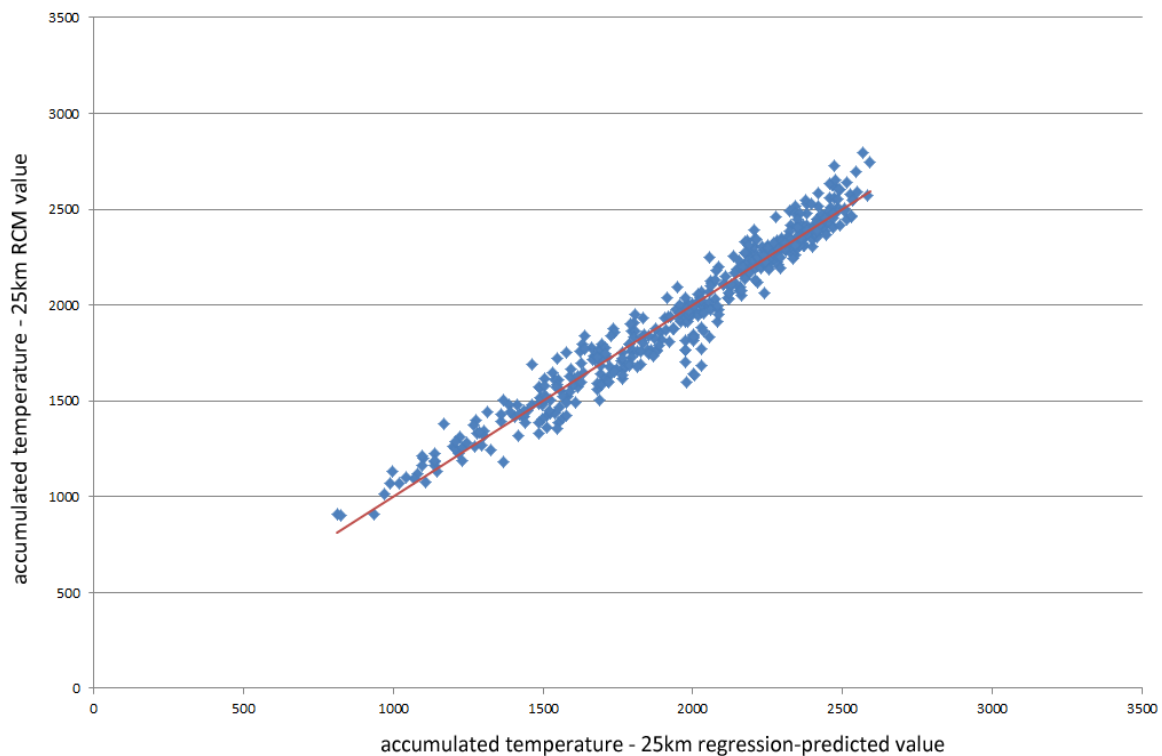


Figure 3. Plot of predicted values against actual values for accumulated temperature from multiple linear regression analysis on model 3q3, 2050s ($r^2 = 0.95$).

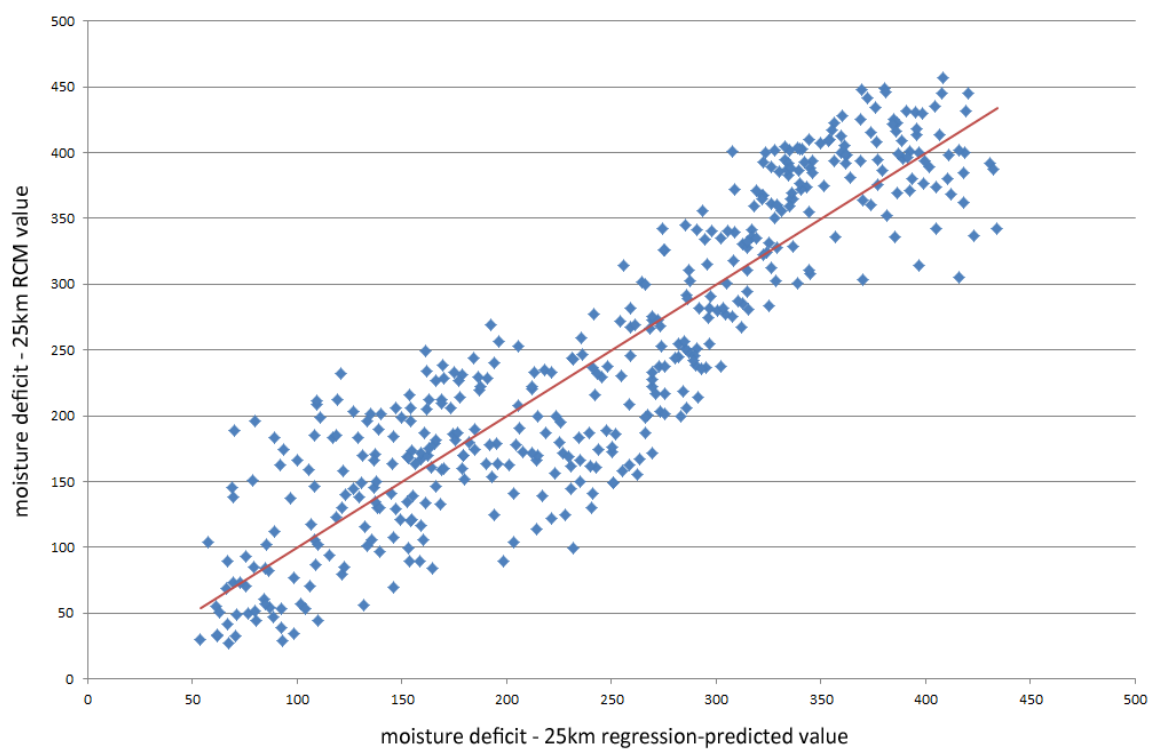


Figure 4. Plot of predicted values against actual values for moisture deficit from multiple linear regression analysis on model 3q3, 2050s ($r^2 = 0.82$).

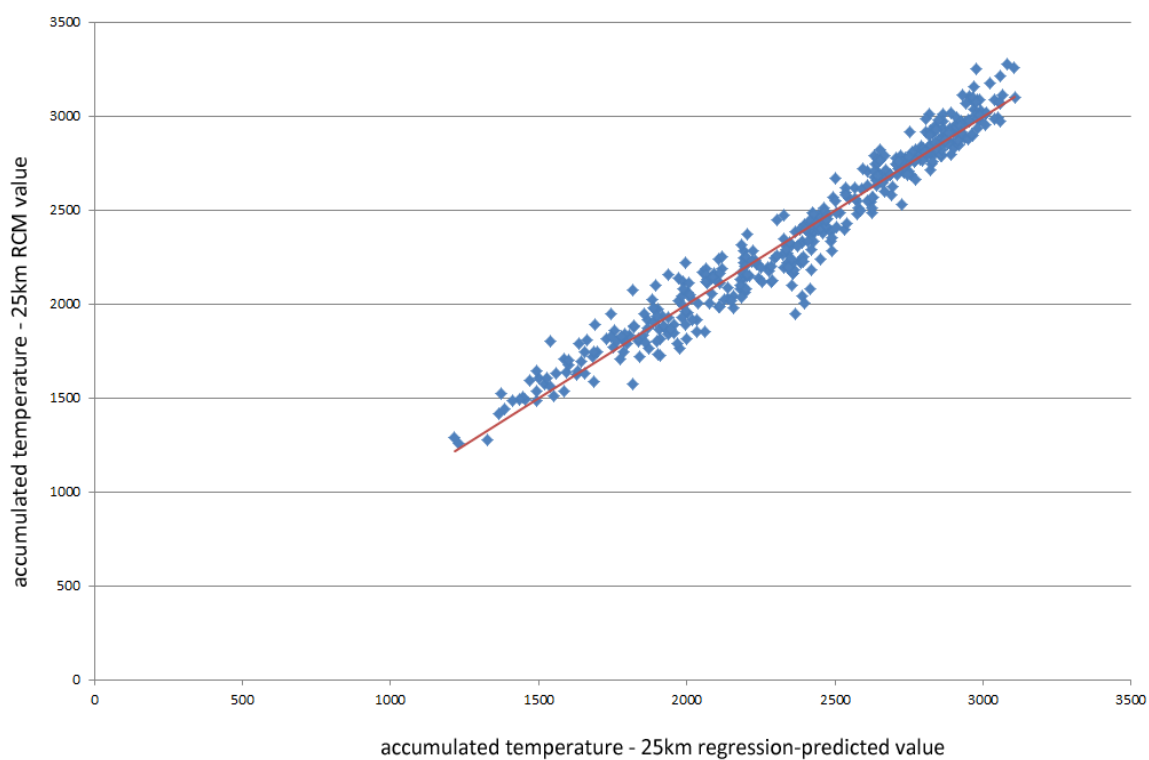


Figure 5. Plot of predicted values against actual values for accumulated temperature from multiple linear regression analysis on model 3q0, 2080s ($r^2 = 0.95$).

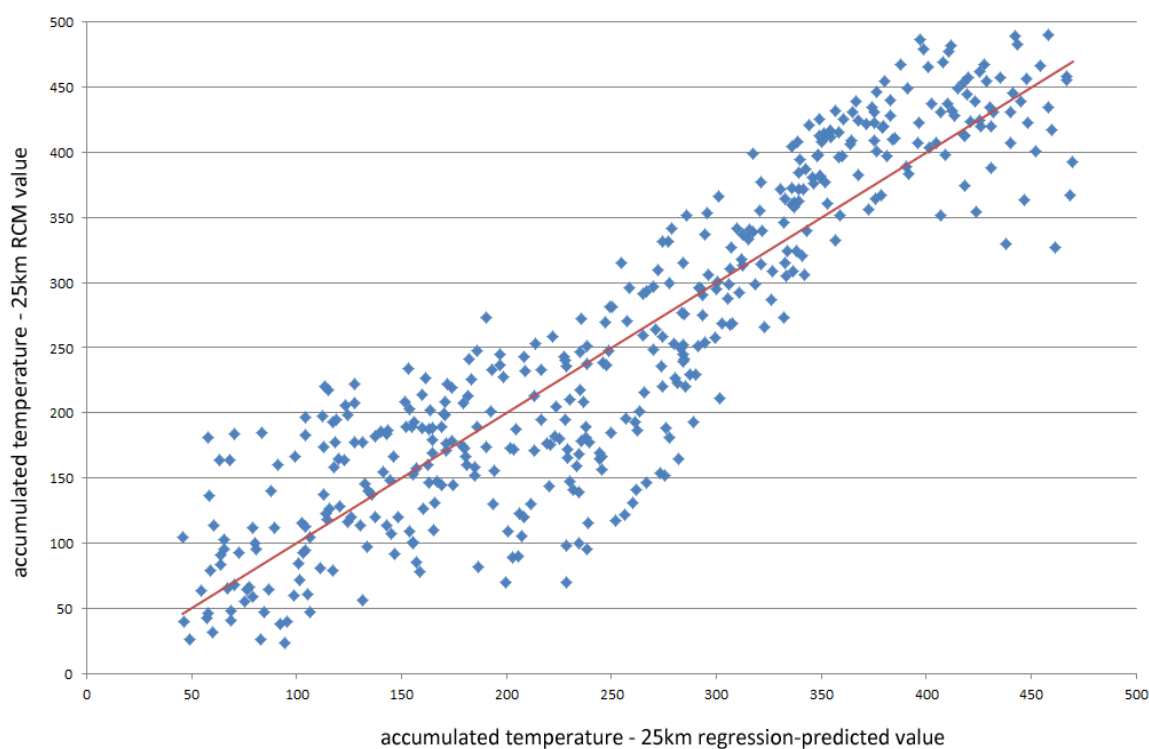


Figure 6. Plot of predicted values against actual values for moisture deficit from multiple linear regression analysis on model 3q0, 2080s ($r^2 = 0.82$).

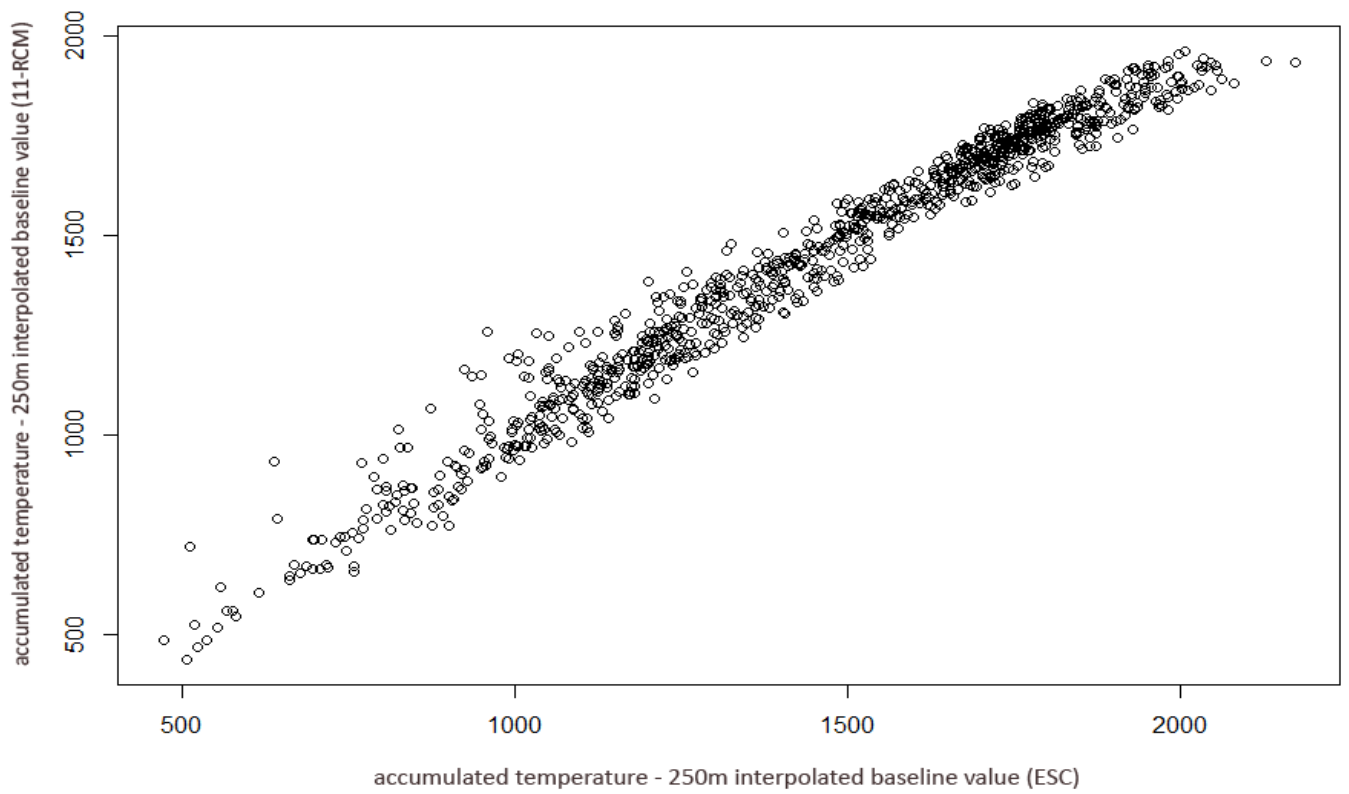


Figure 7. Plot of 1000 randomly-sampled point pairs of 250m accumulated temperature baseline datasets from ESC and the 11-RCM data ($r^2 = 0.97$)

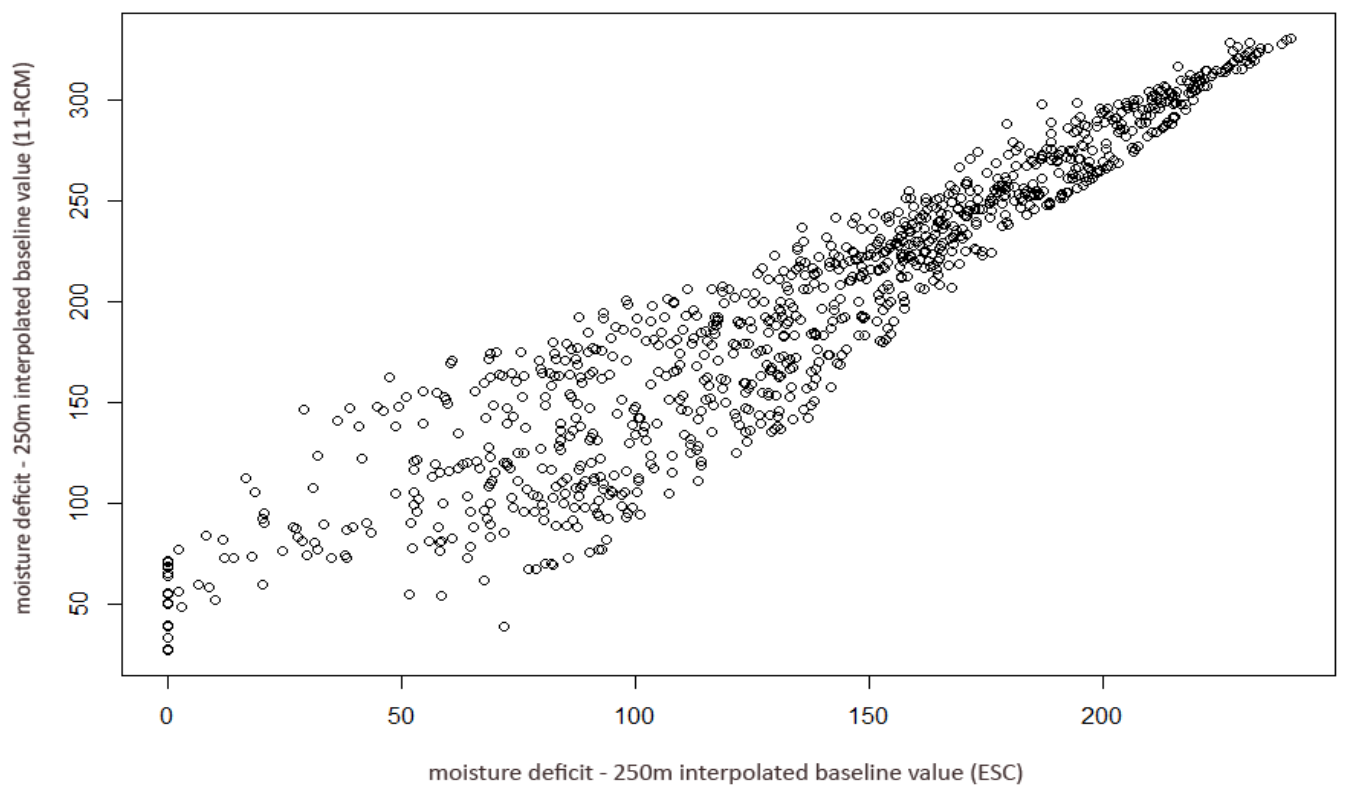


Figure 8. Plot of 1000 randomly-sampled point pairs of 250m moisture deficit baseline datasets from ESC and the 11-RCM data ($r^2 = 0.89$)

Appendix C - Section C2

This section of Appendix C provides a graphical matrix of all of the results from a simulation study of ecosystem service provision from two forests (Clocaenog and Gwydr forests) in North Wales. The simulation uses 12 climate futures – no climate change and the 11 variants of the 11-member RCM for UK, available from the British Atmospheric Data Centre (BADC). Four forest management trajectories were developed for the simulation:

Business as usual (BAU)

Species diversity (DIV)

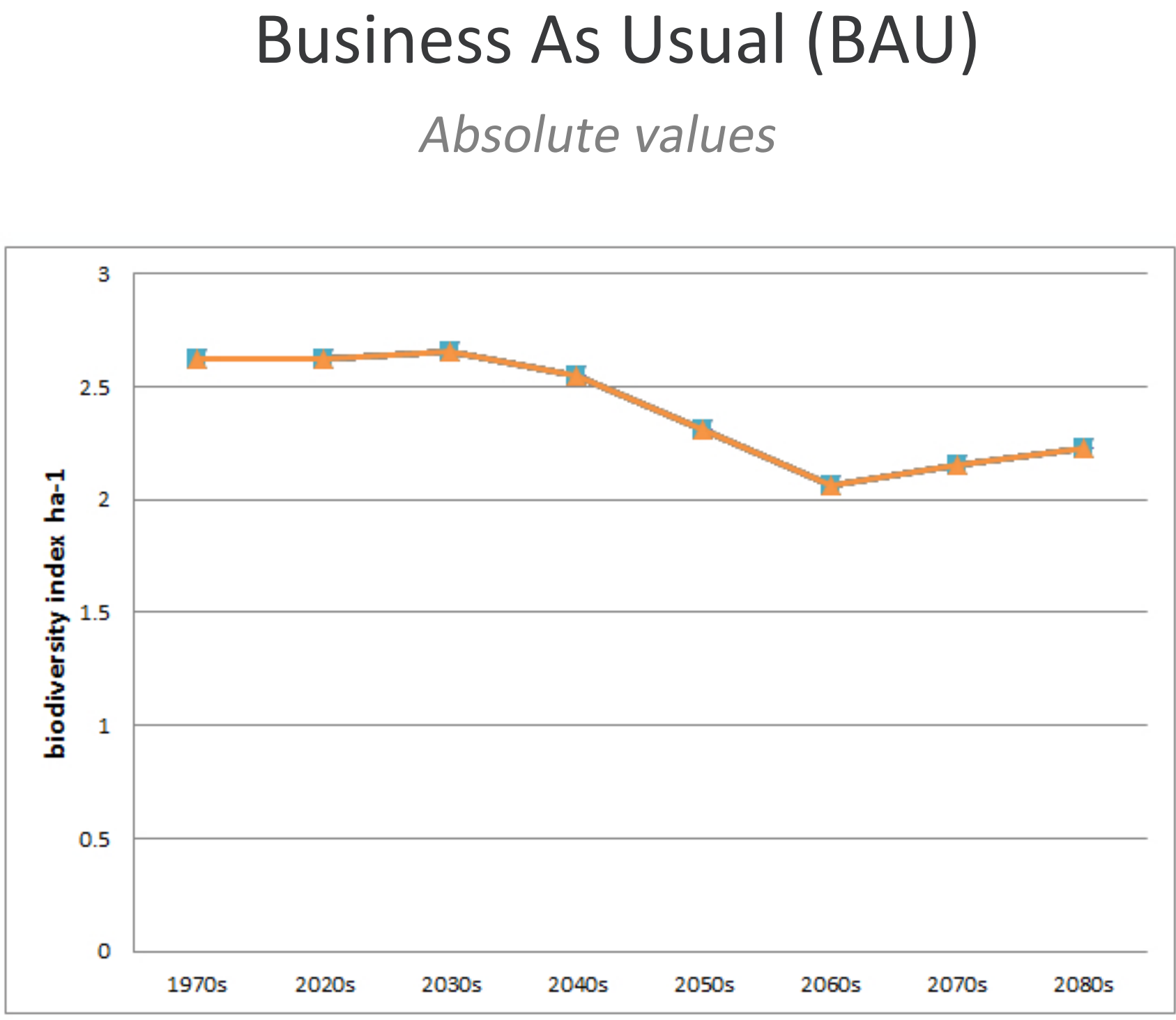
Low impact silvicultural systems (LISS)

Short rotation forestry (SRF)

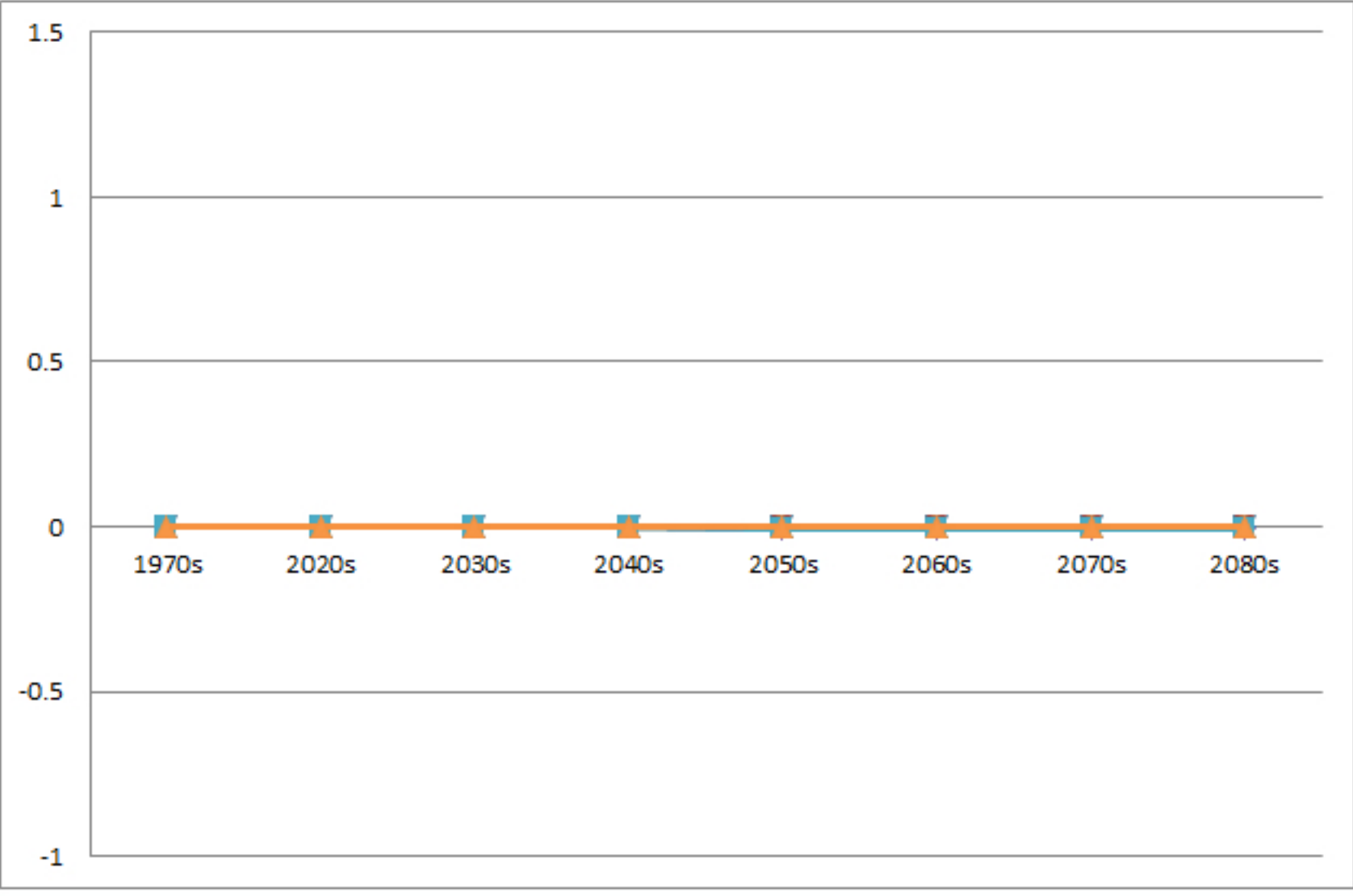
Each of the graphical matrices shows actual results for the BAU trajectory. The LISS, DIV and SRF trajectories are shown as relative changes to the respective BAU trajectory for each of the nine ecosystem services indicators presented.

Cloacaenog Forest

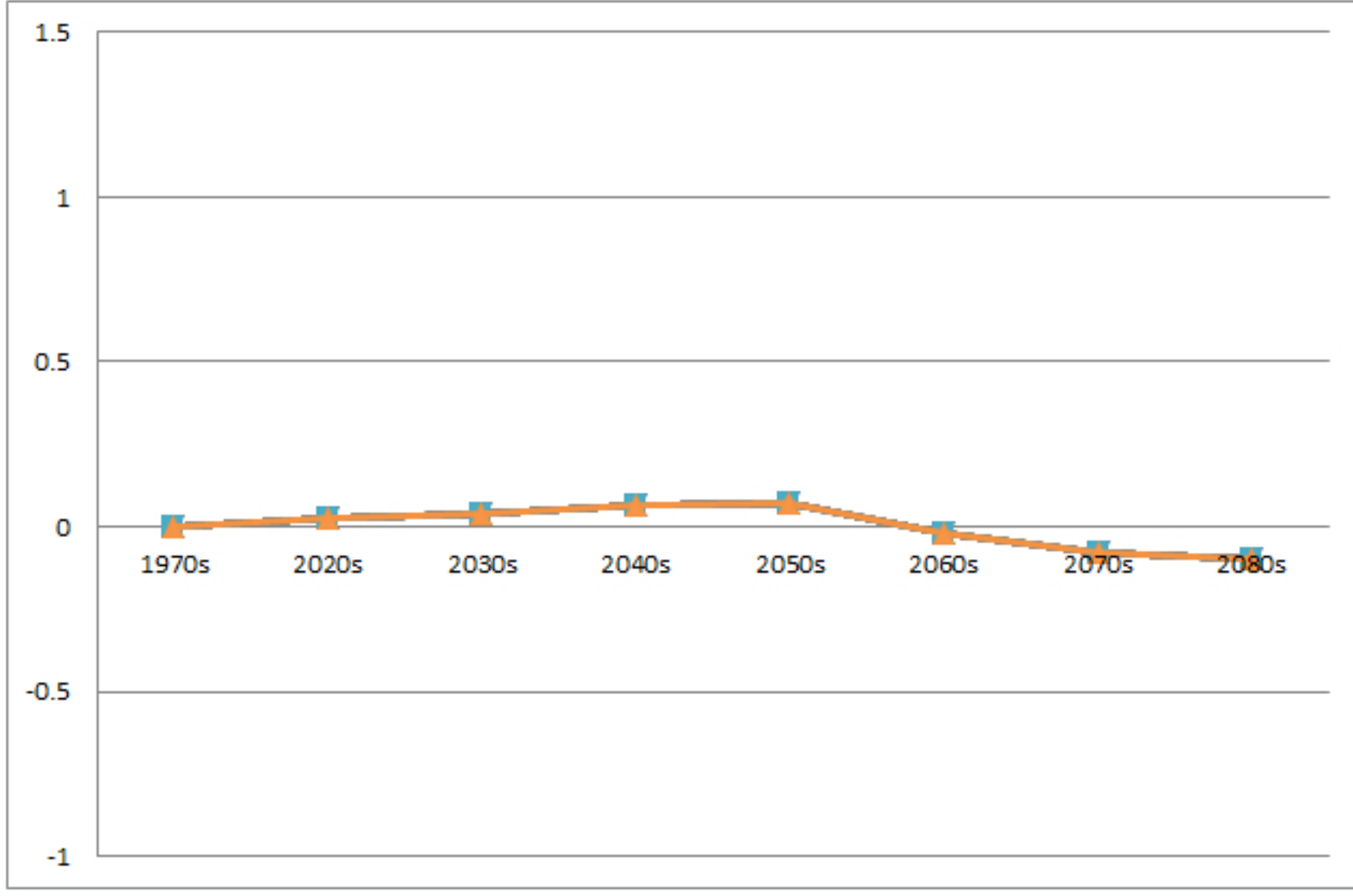
Biodiversity



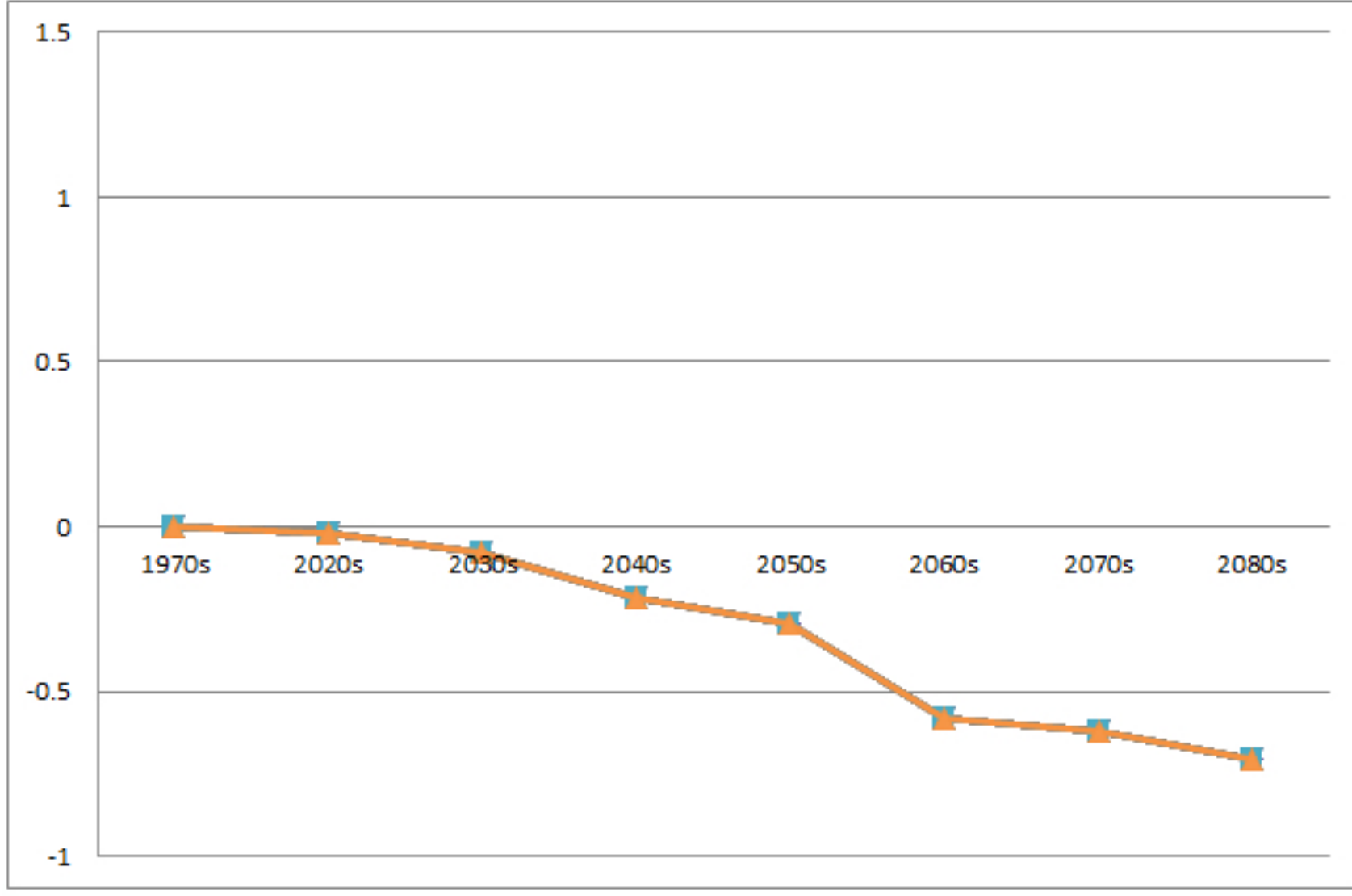
Diversity
Relative change to BAU



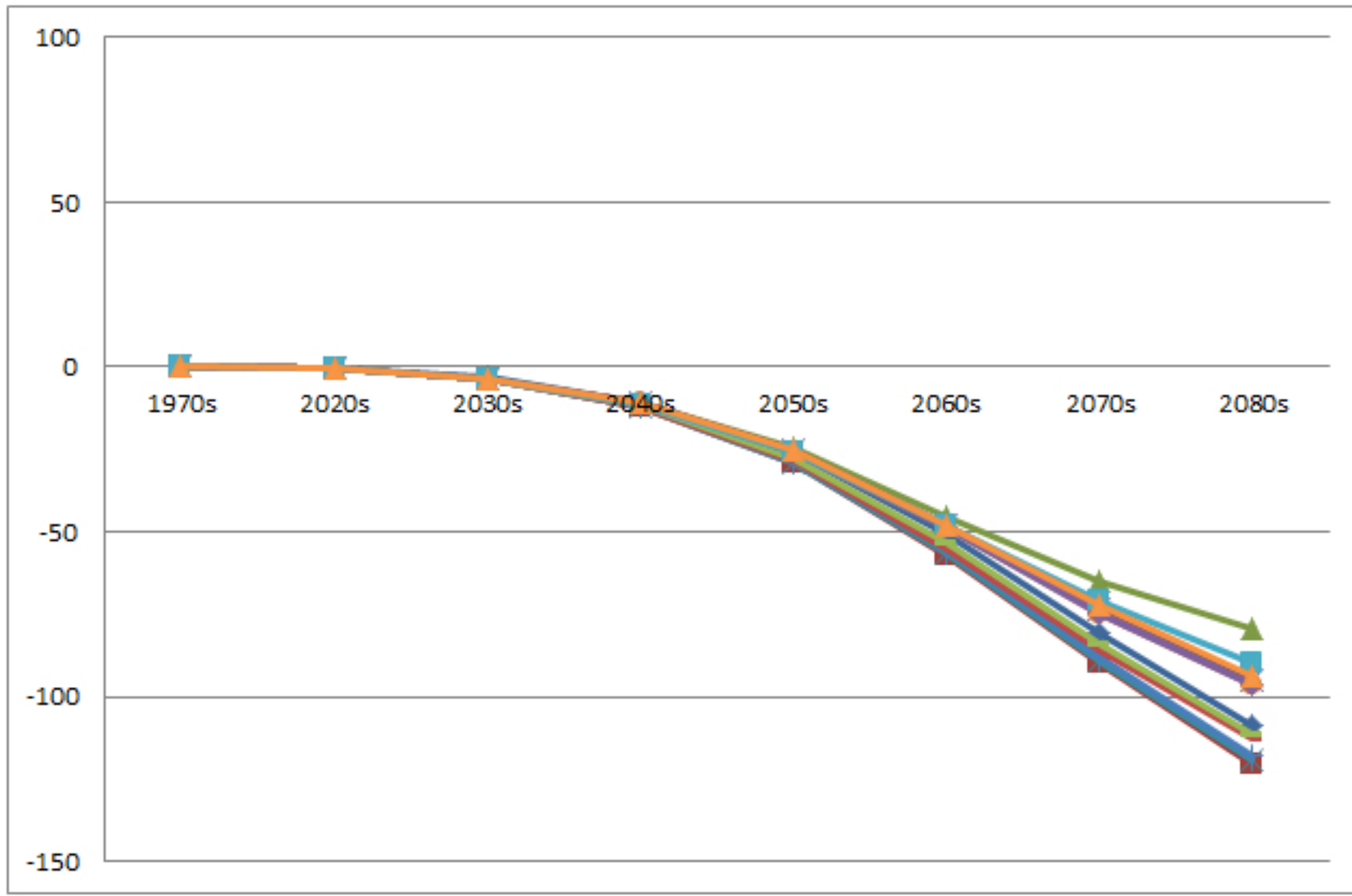
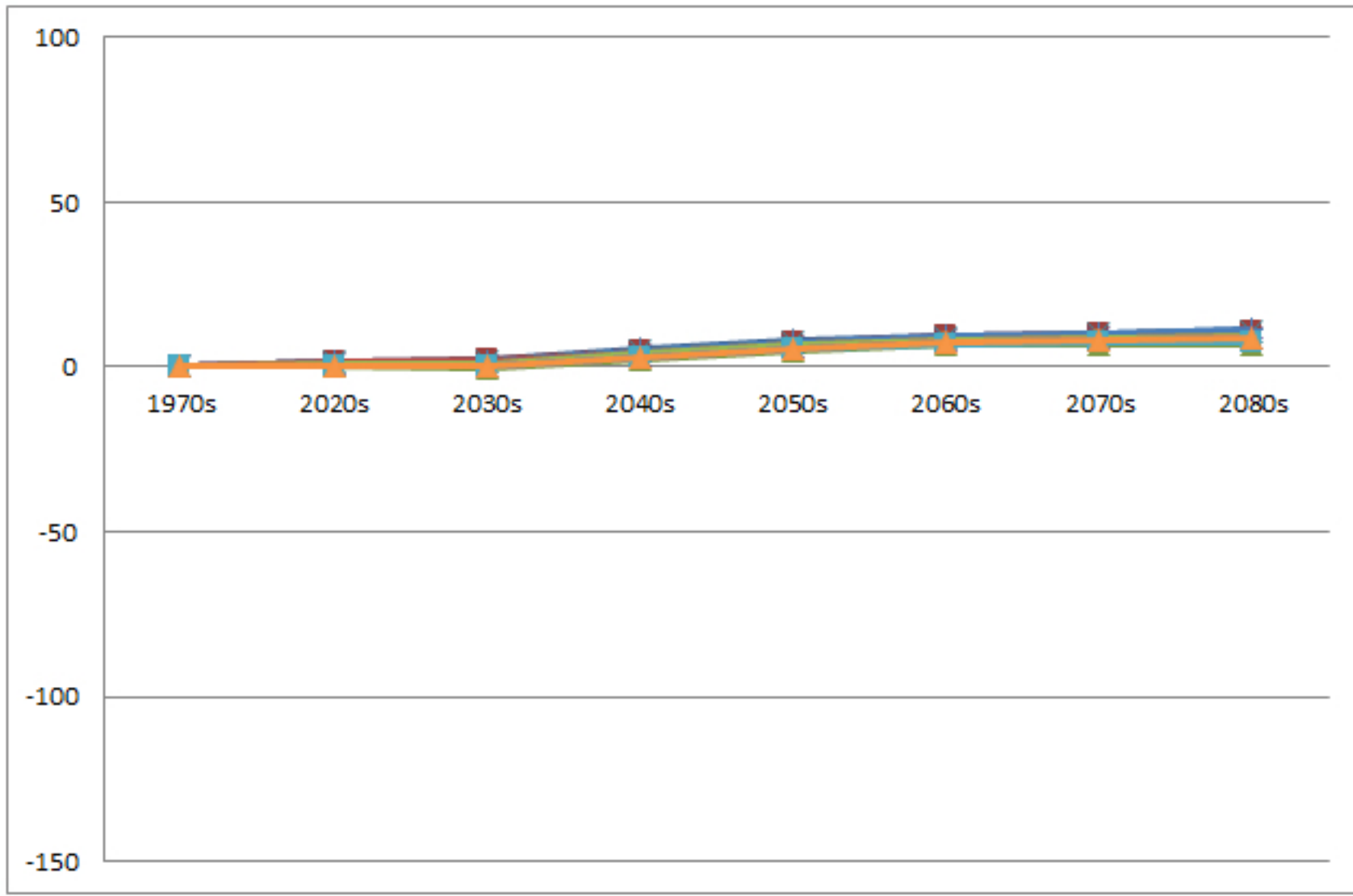
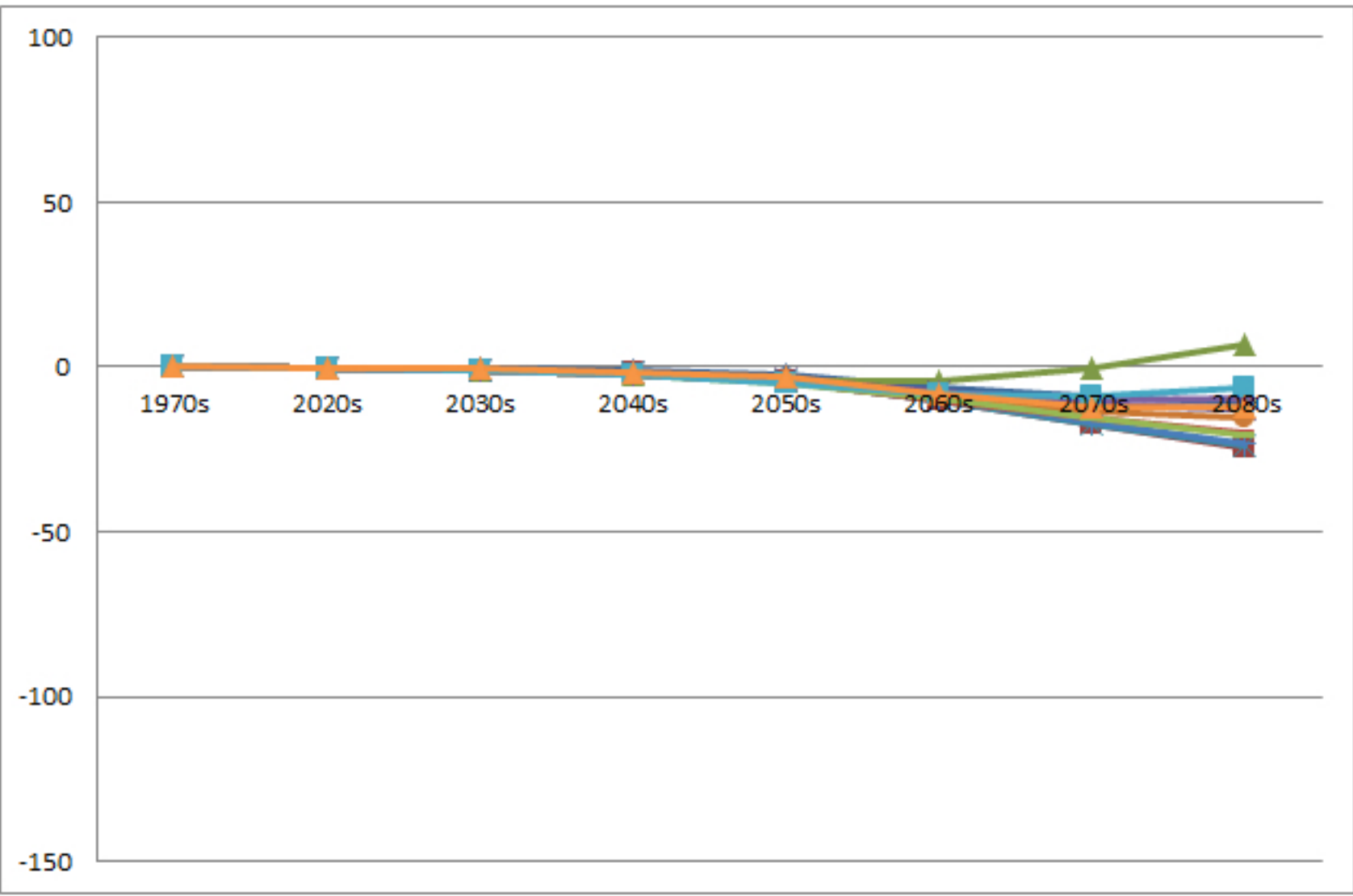
Low Impact Silvicultural Systems
Relative change to BAU



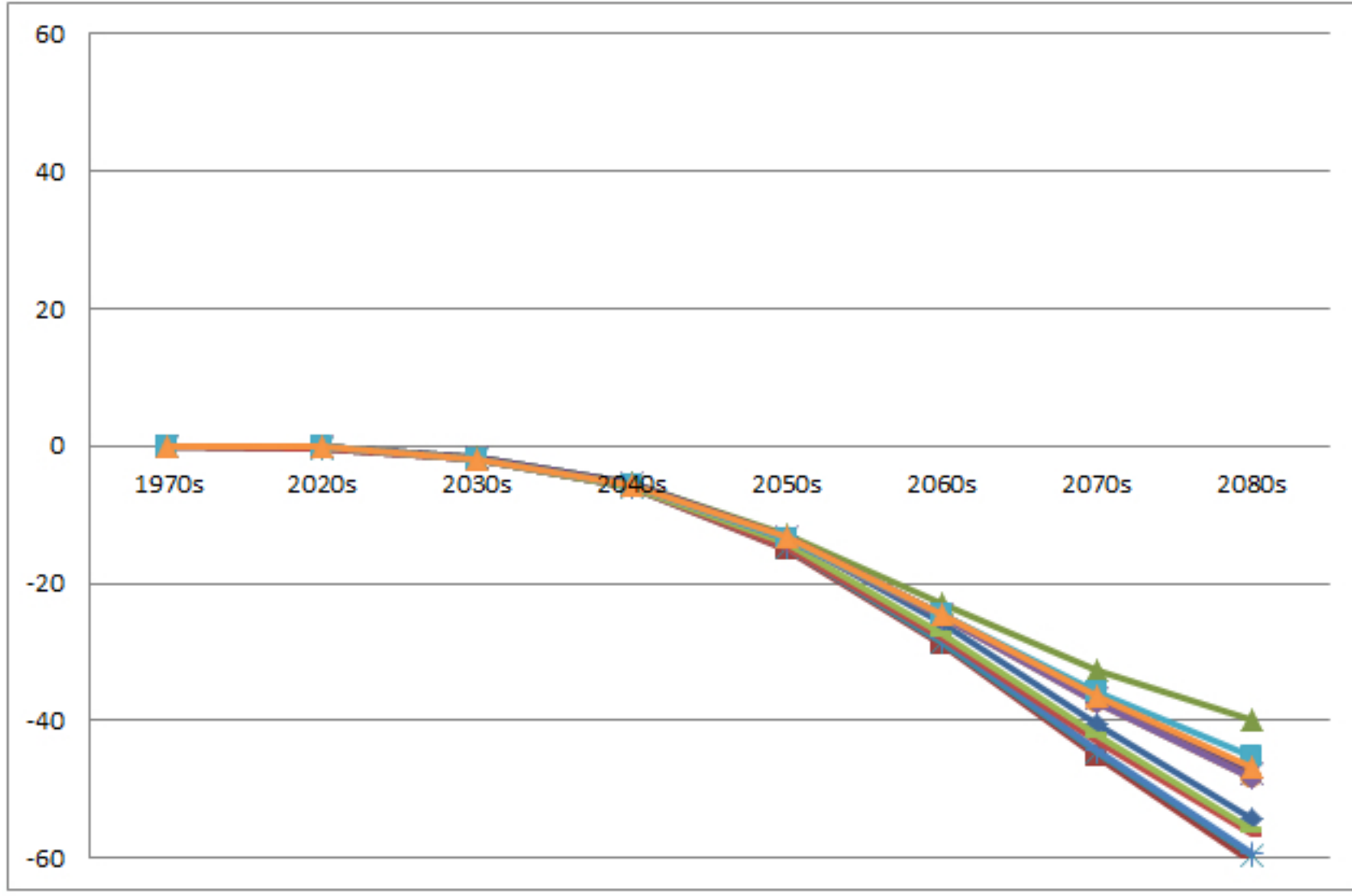
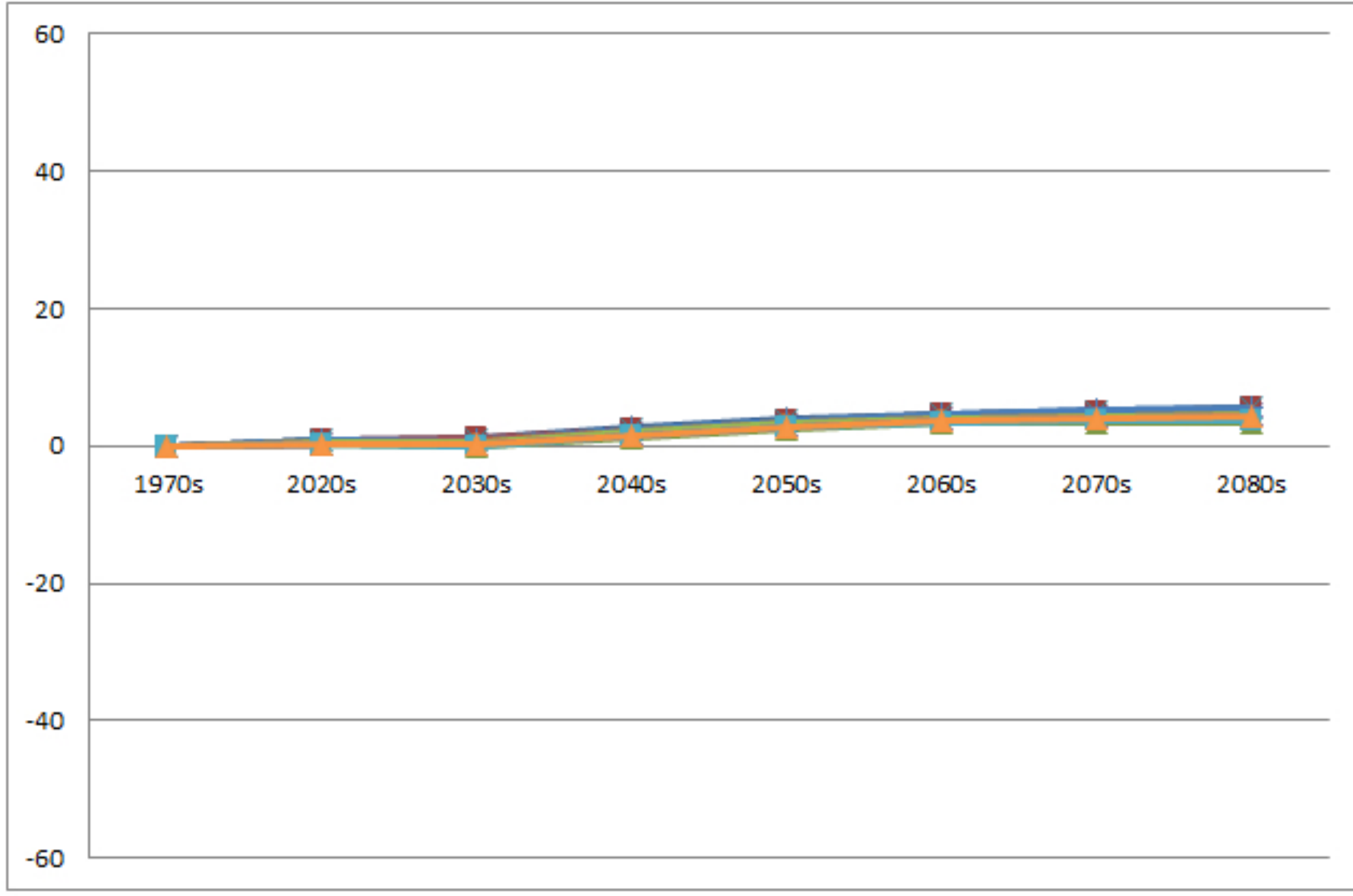
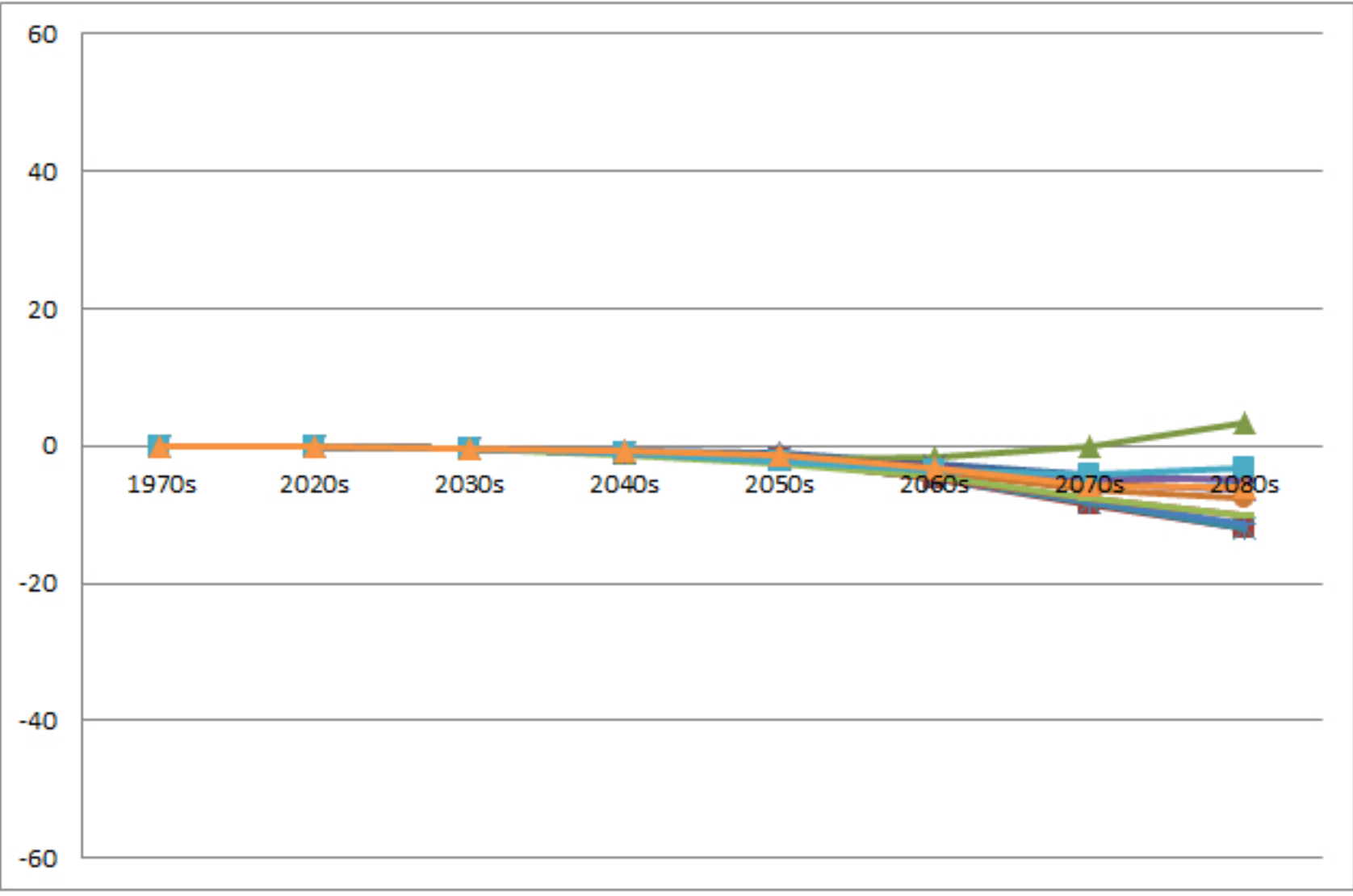
Short Rotation Forestry
Relative change to BAU



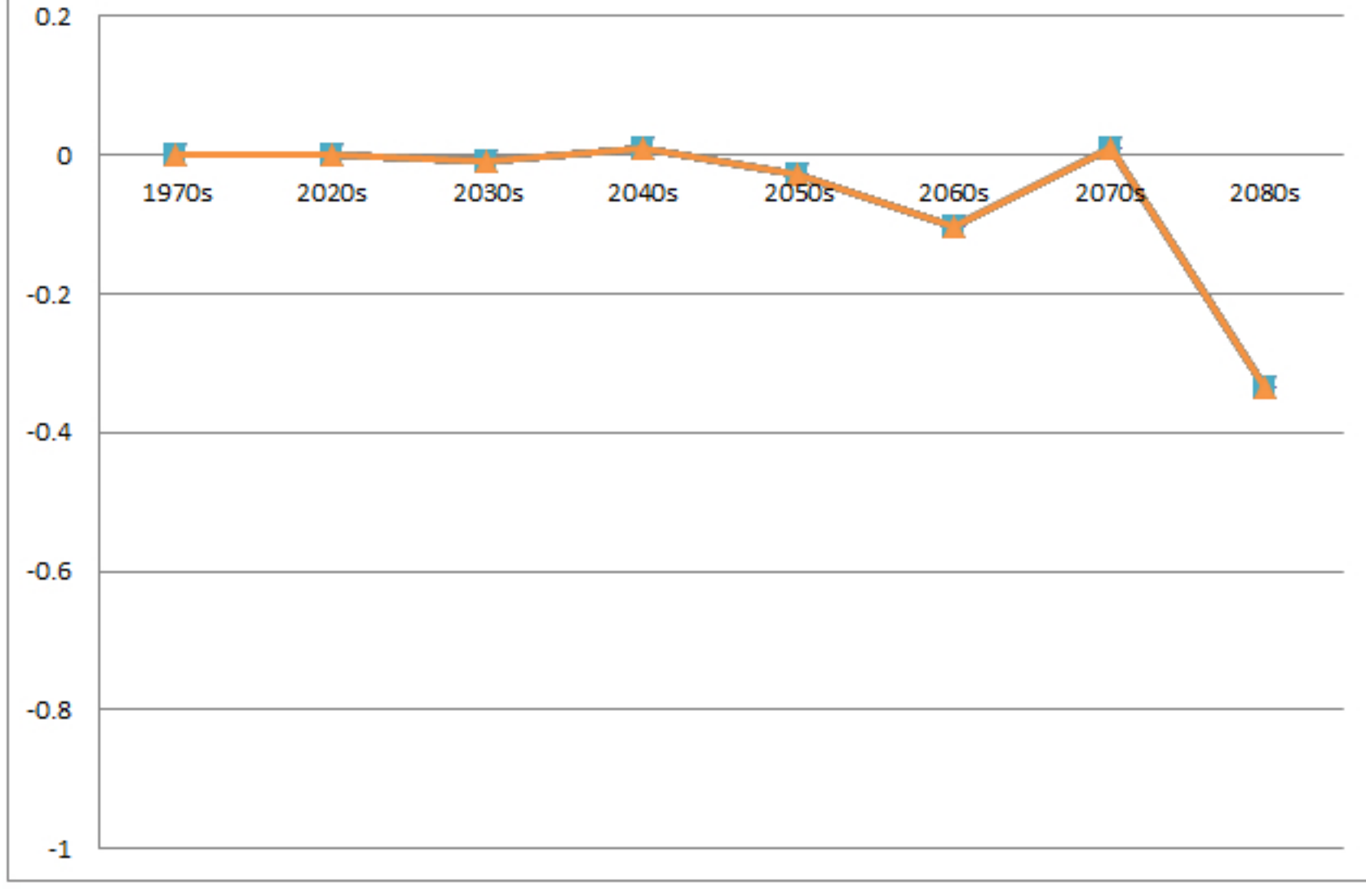
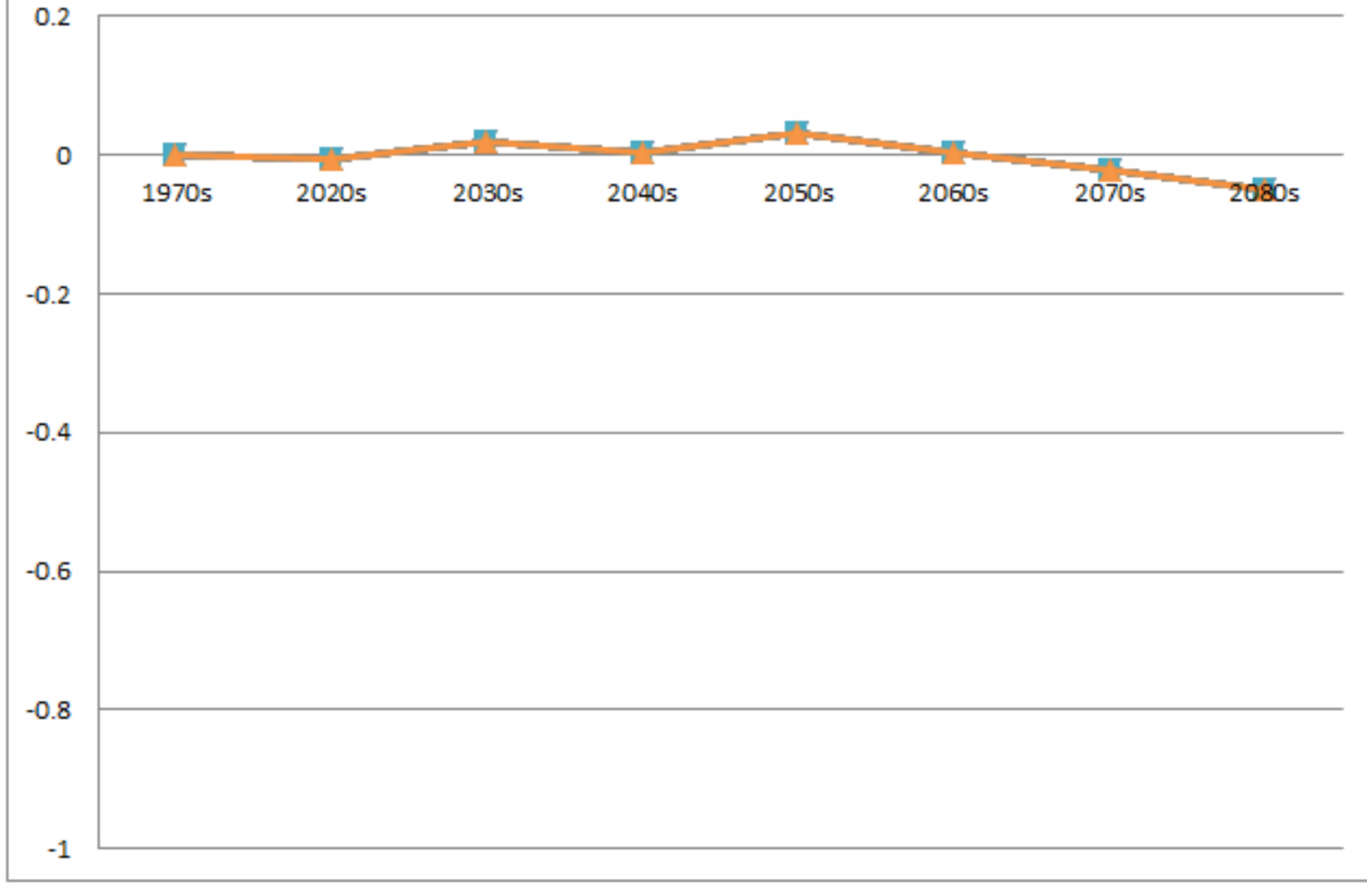
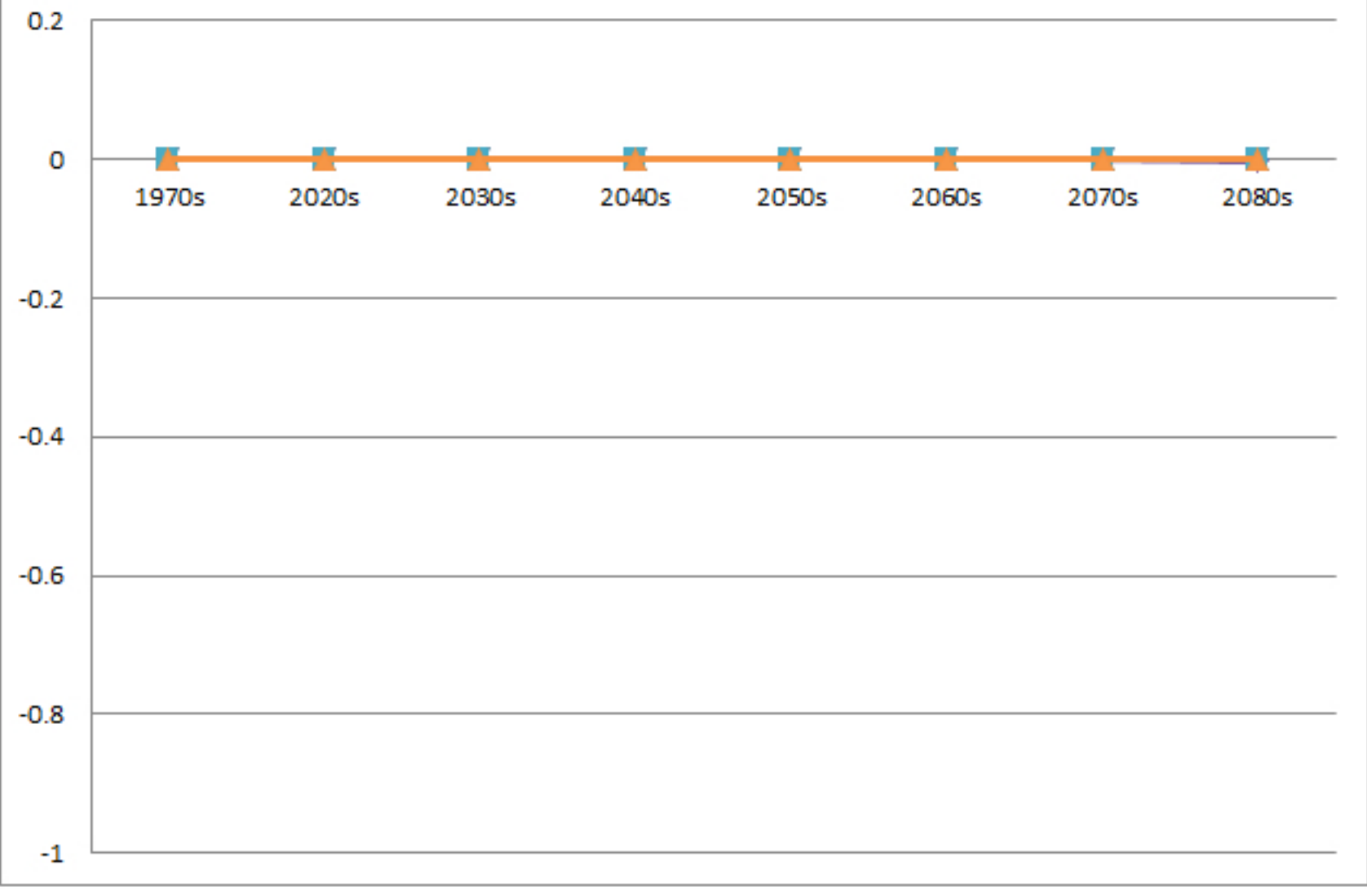
Biomass



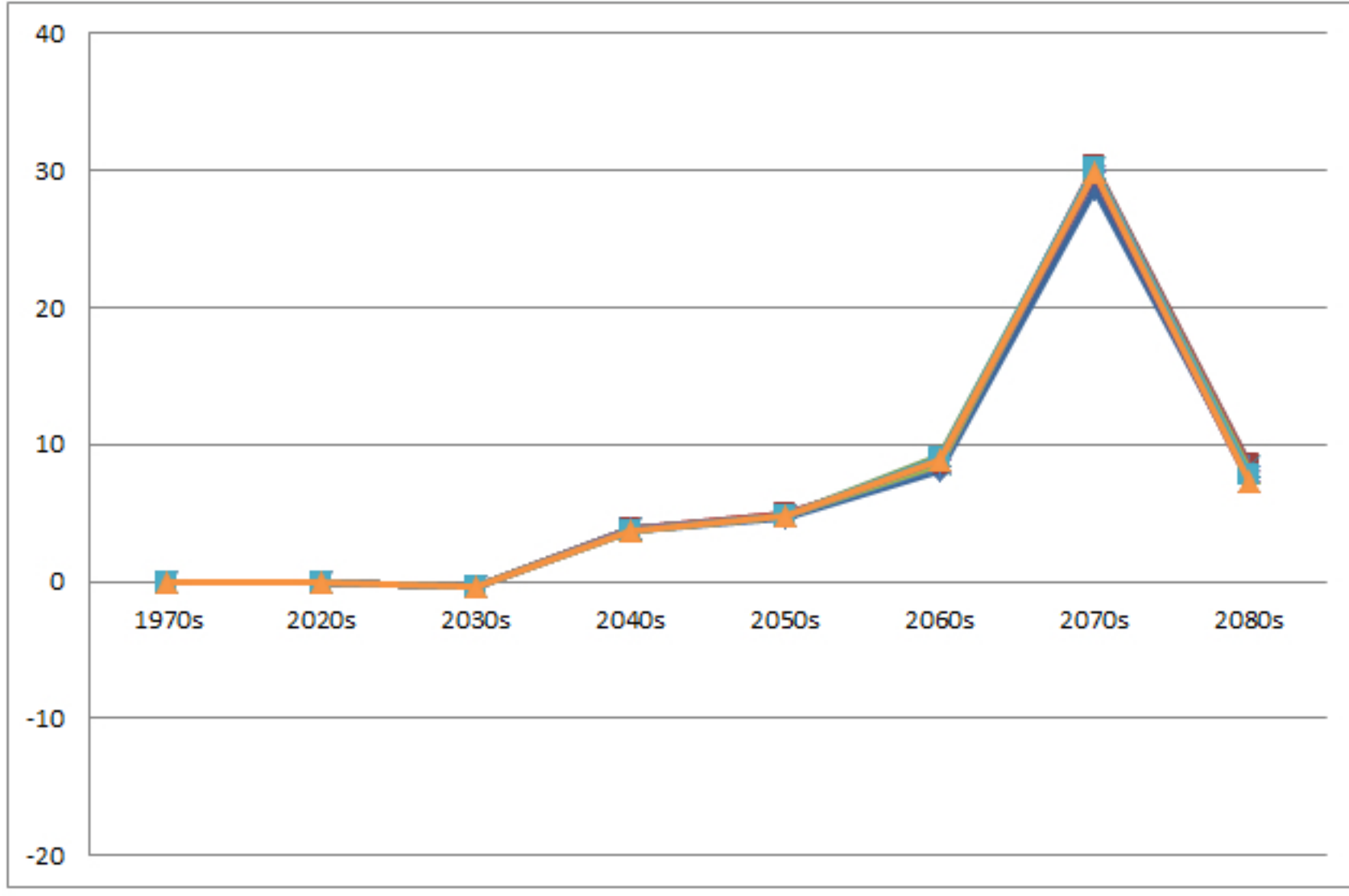
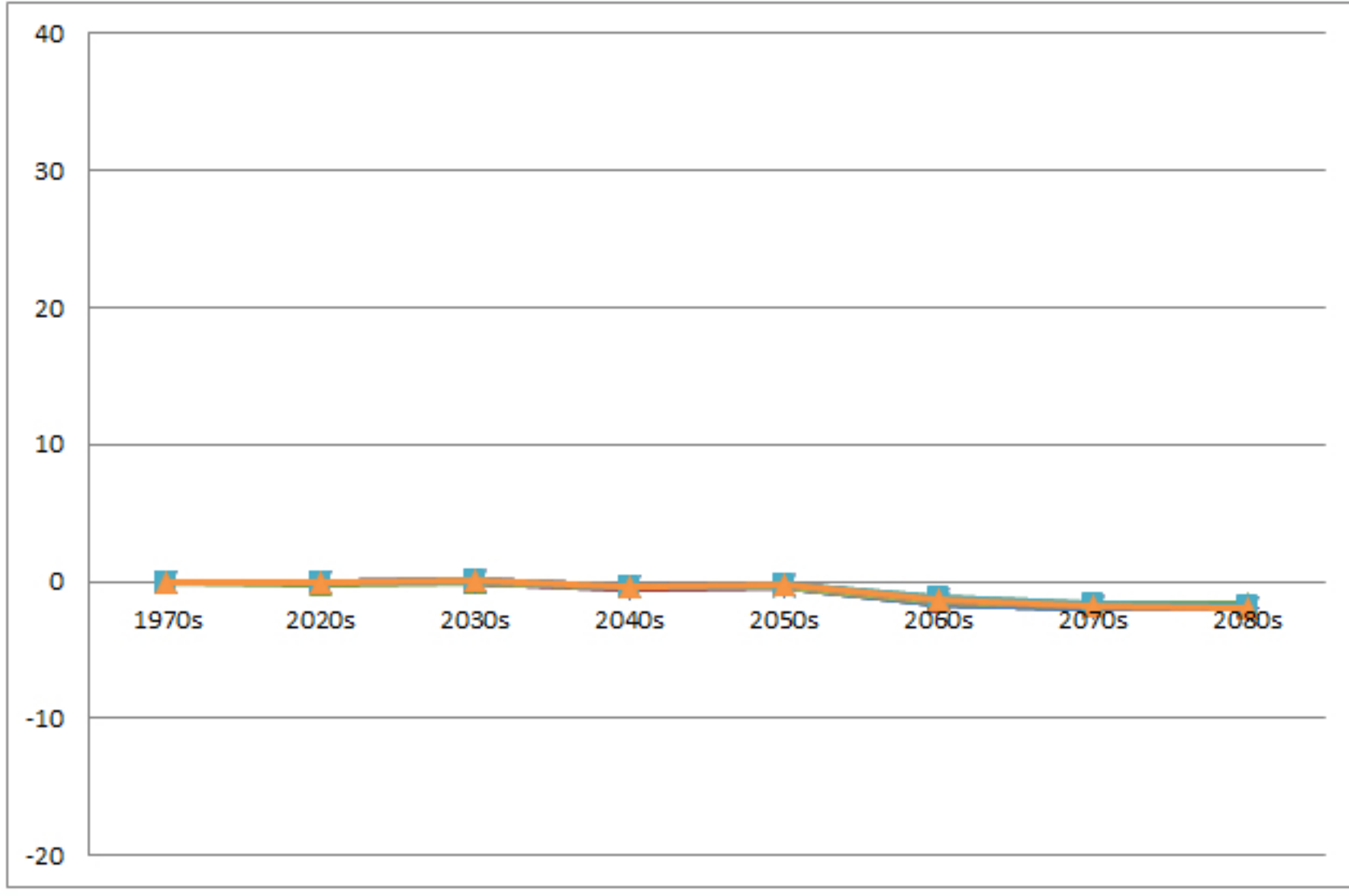
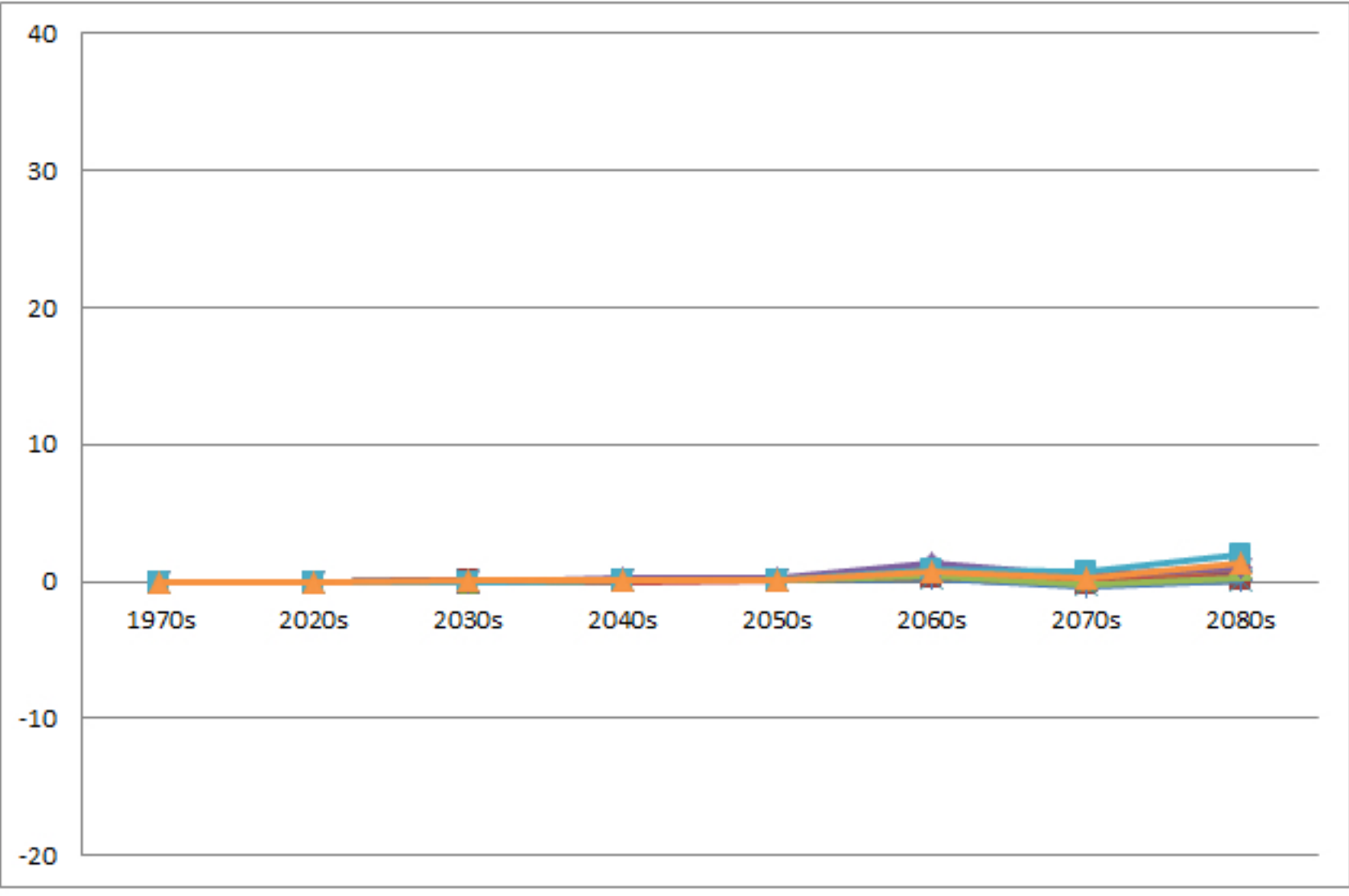
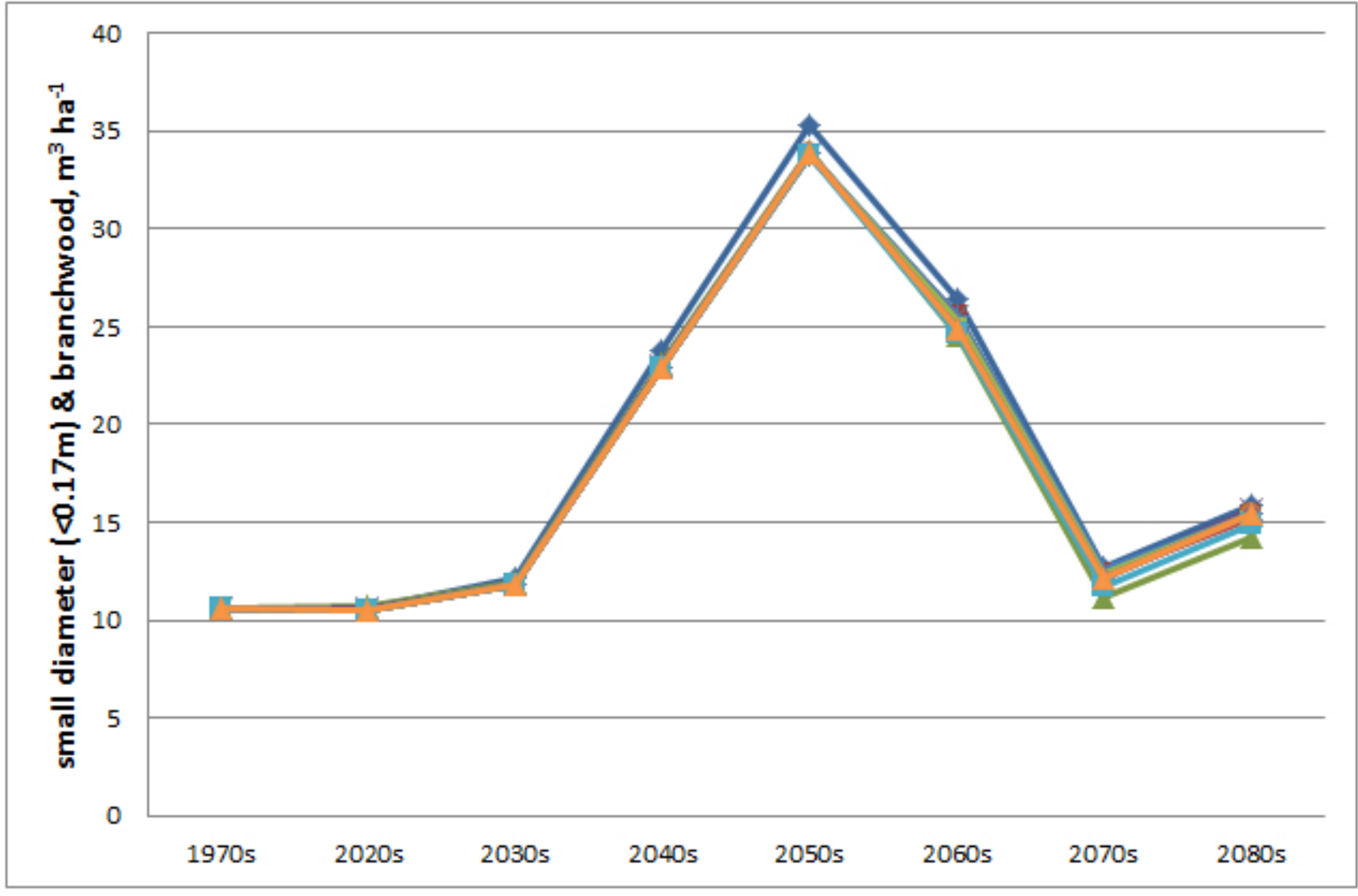
Carbon



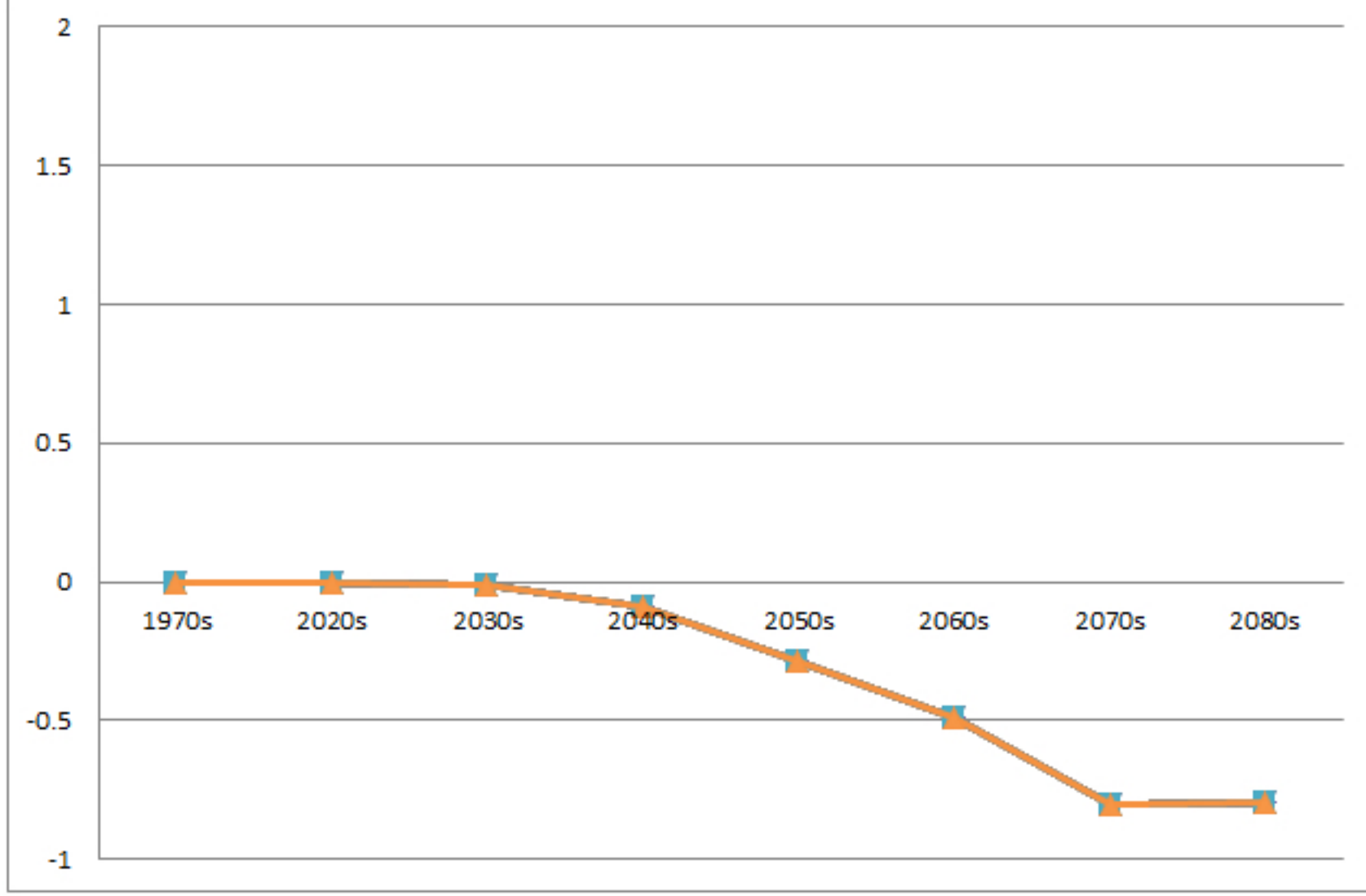
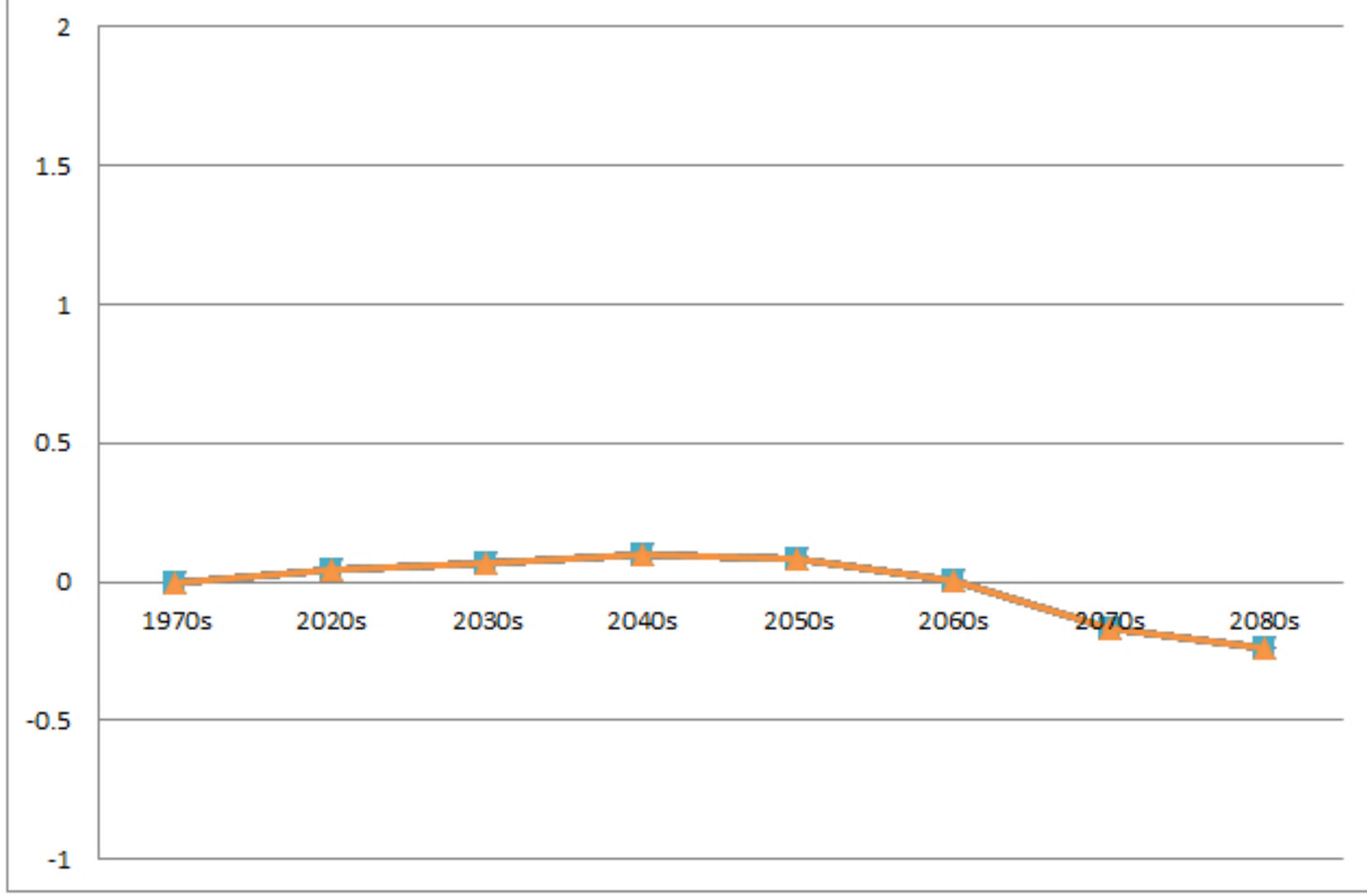
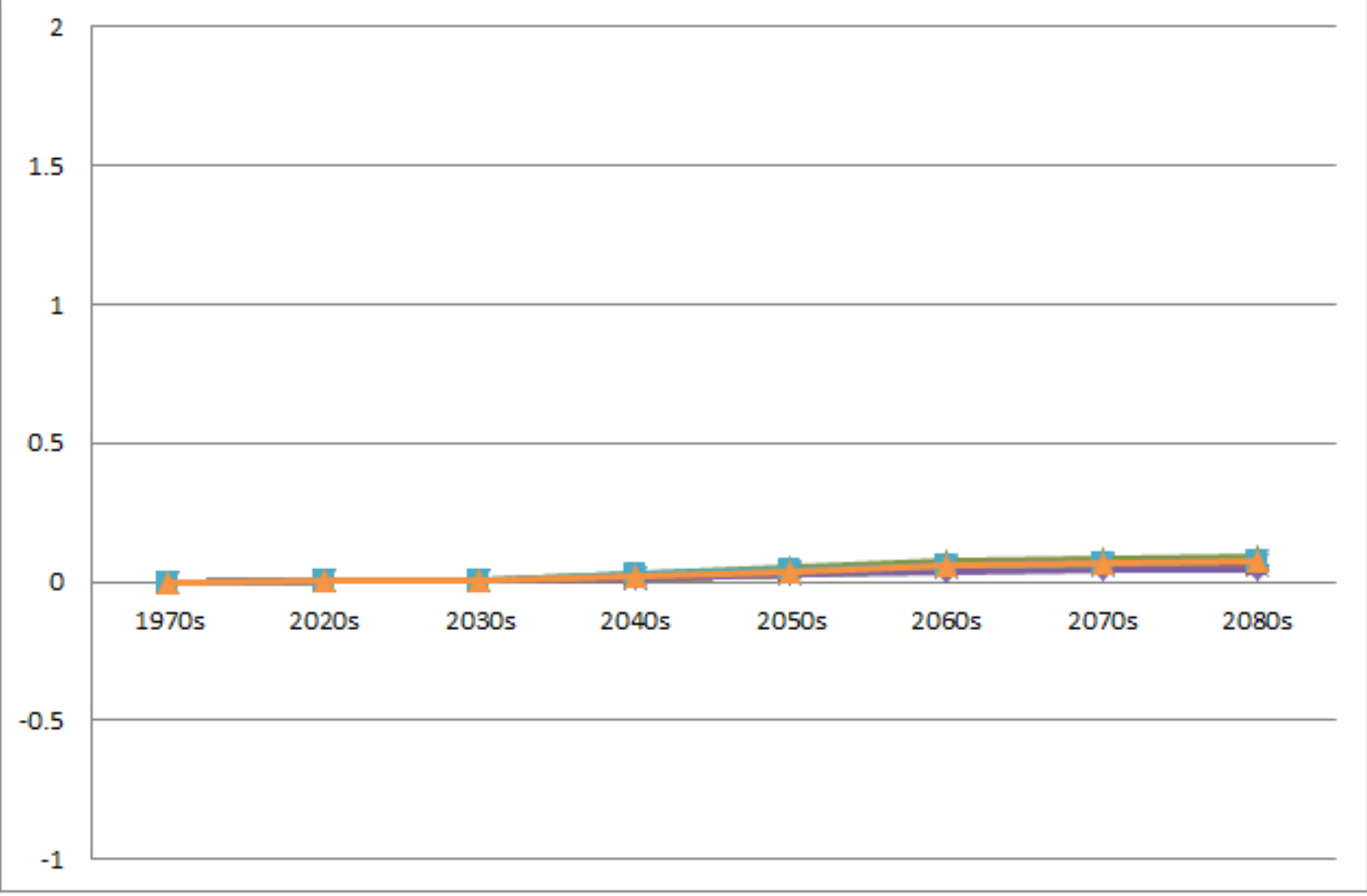
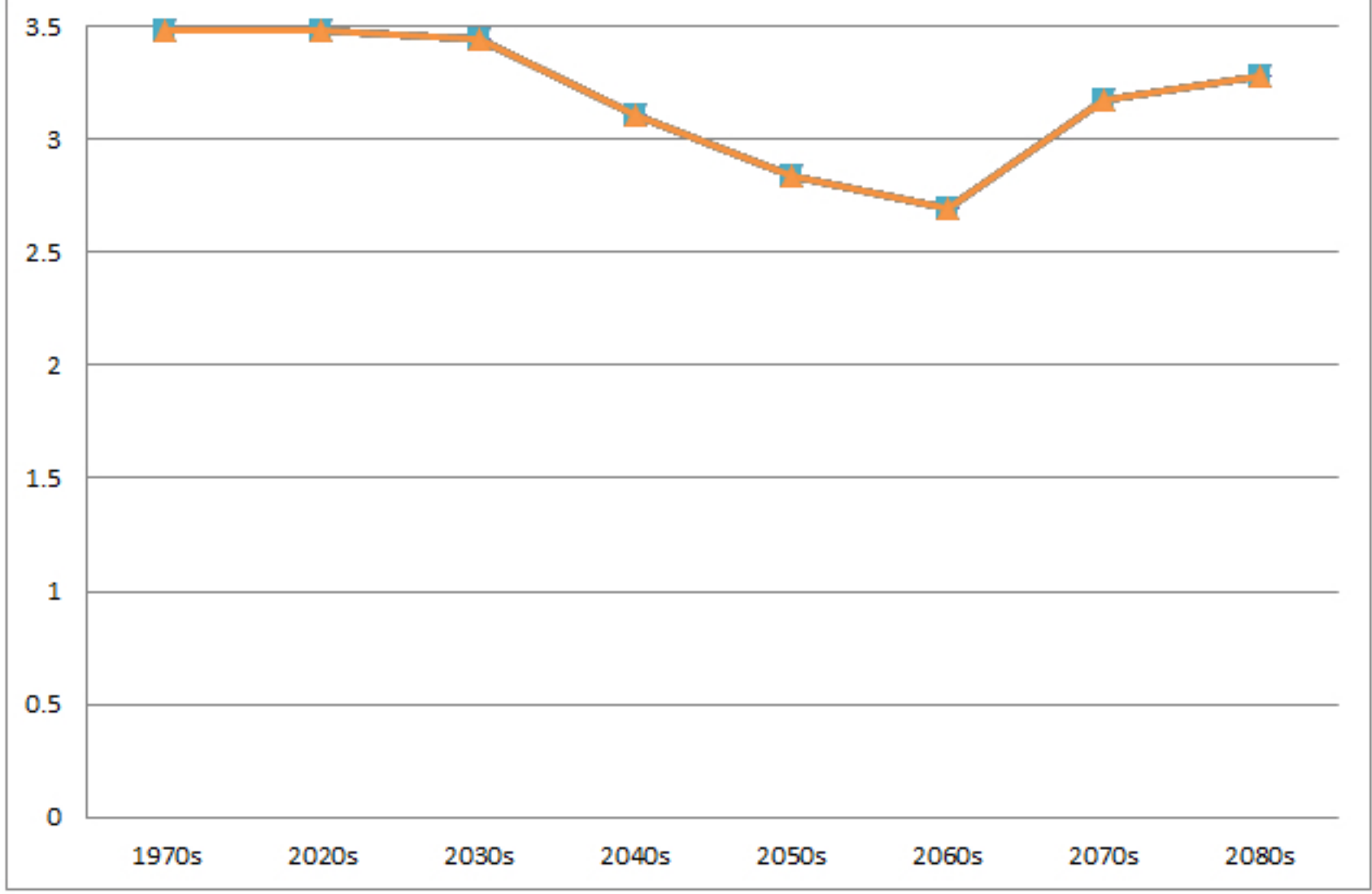
Operations



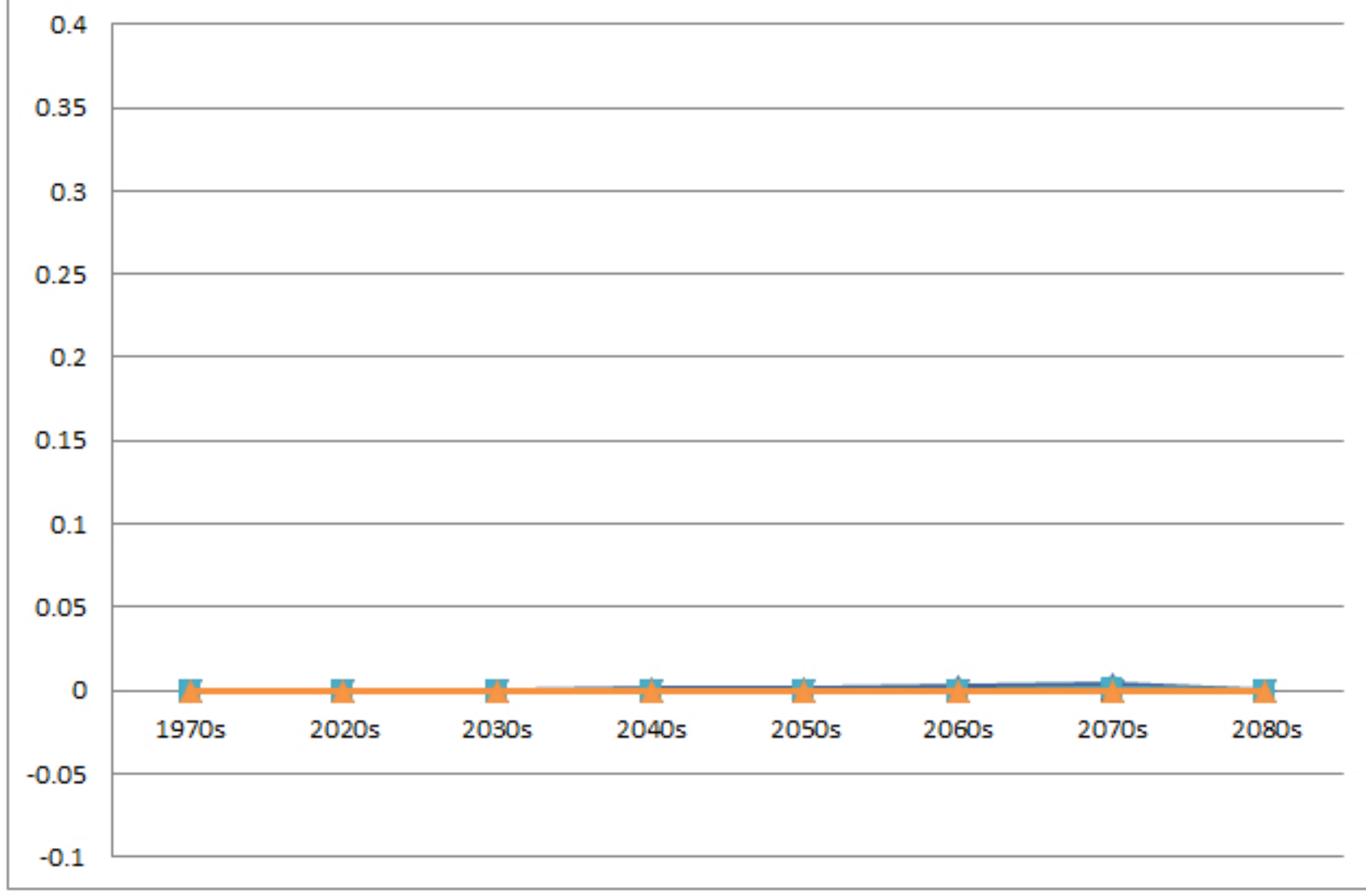
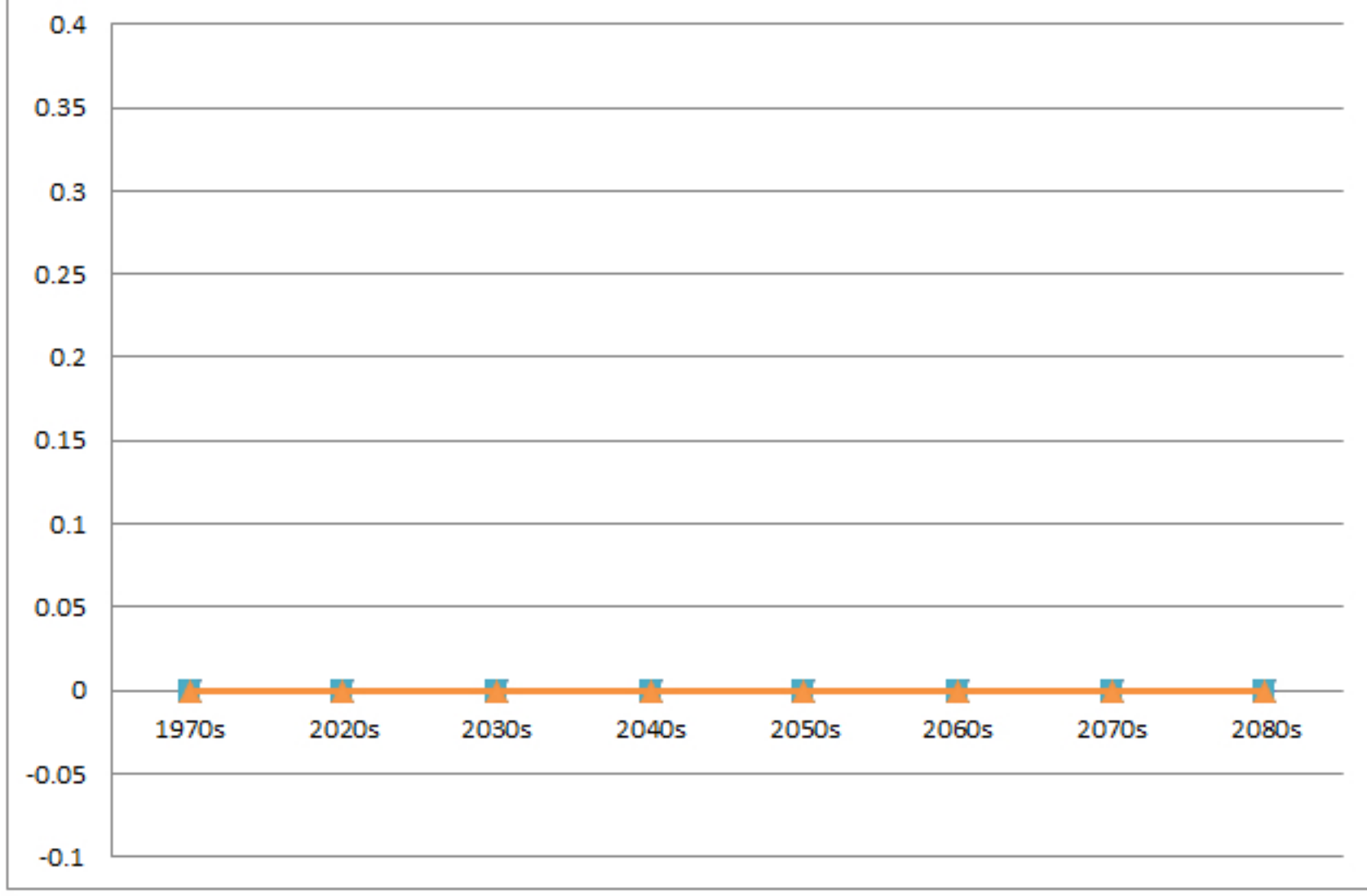
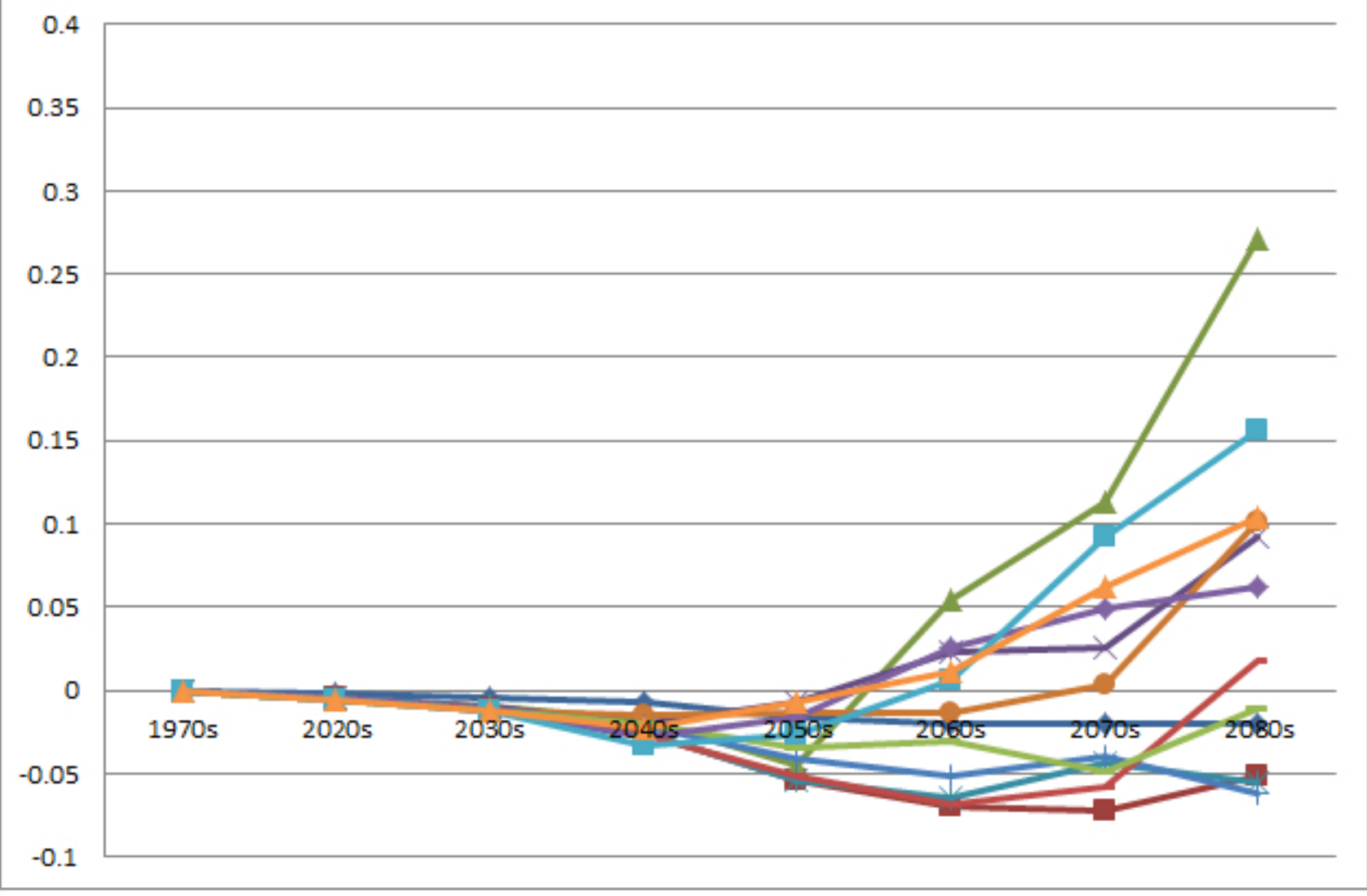
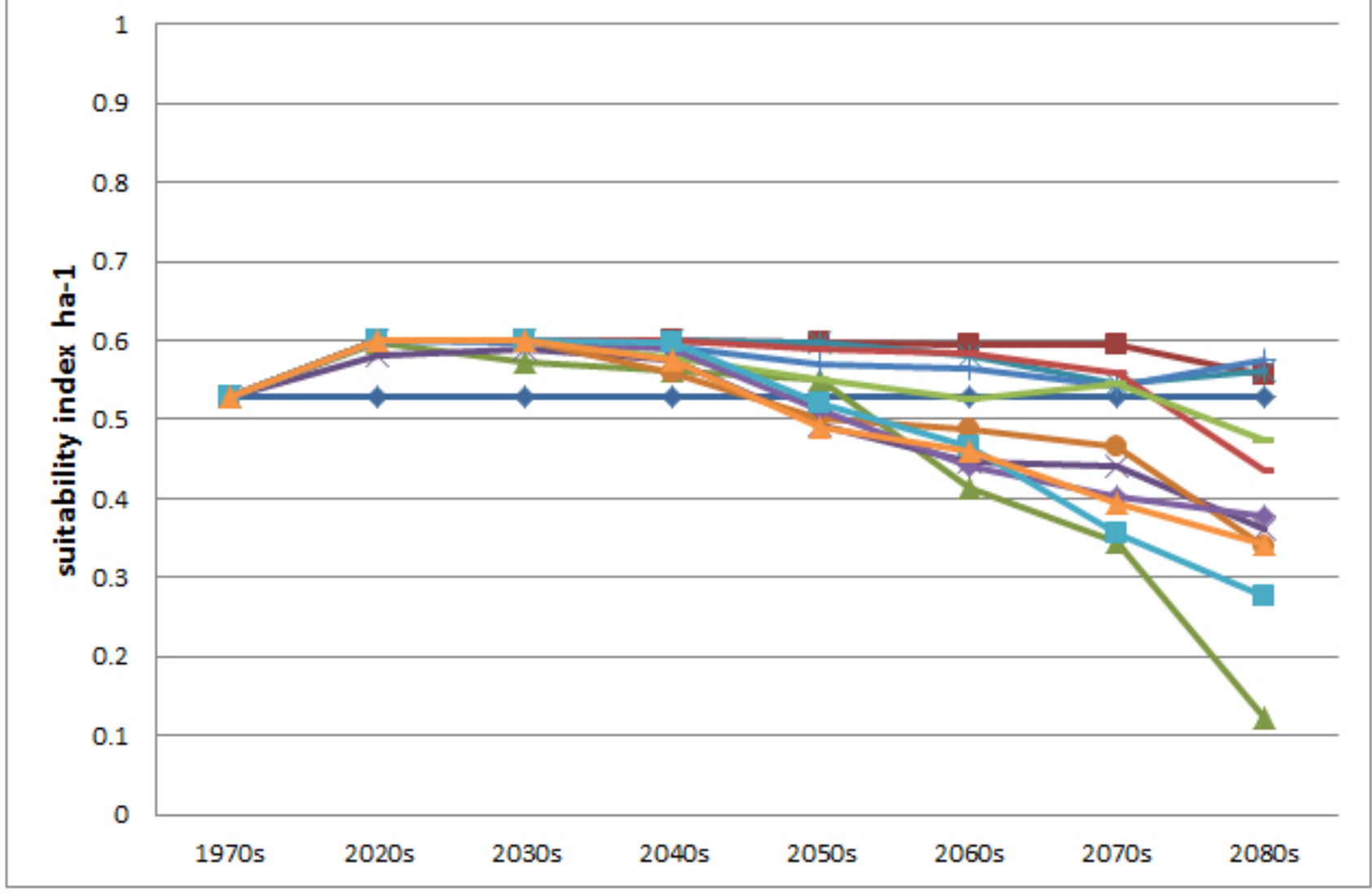
Other



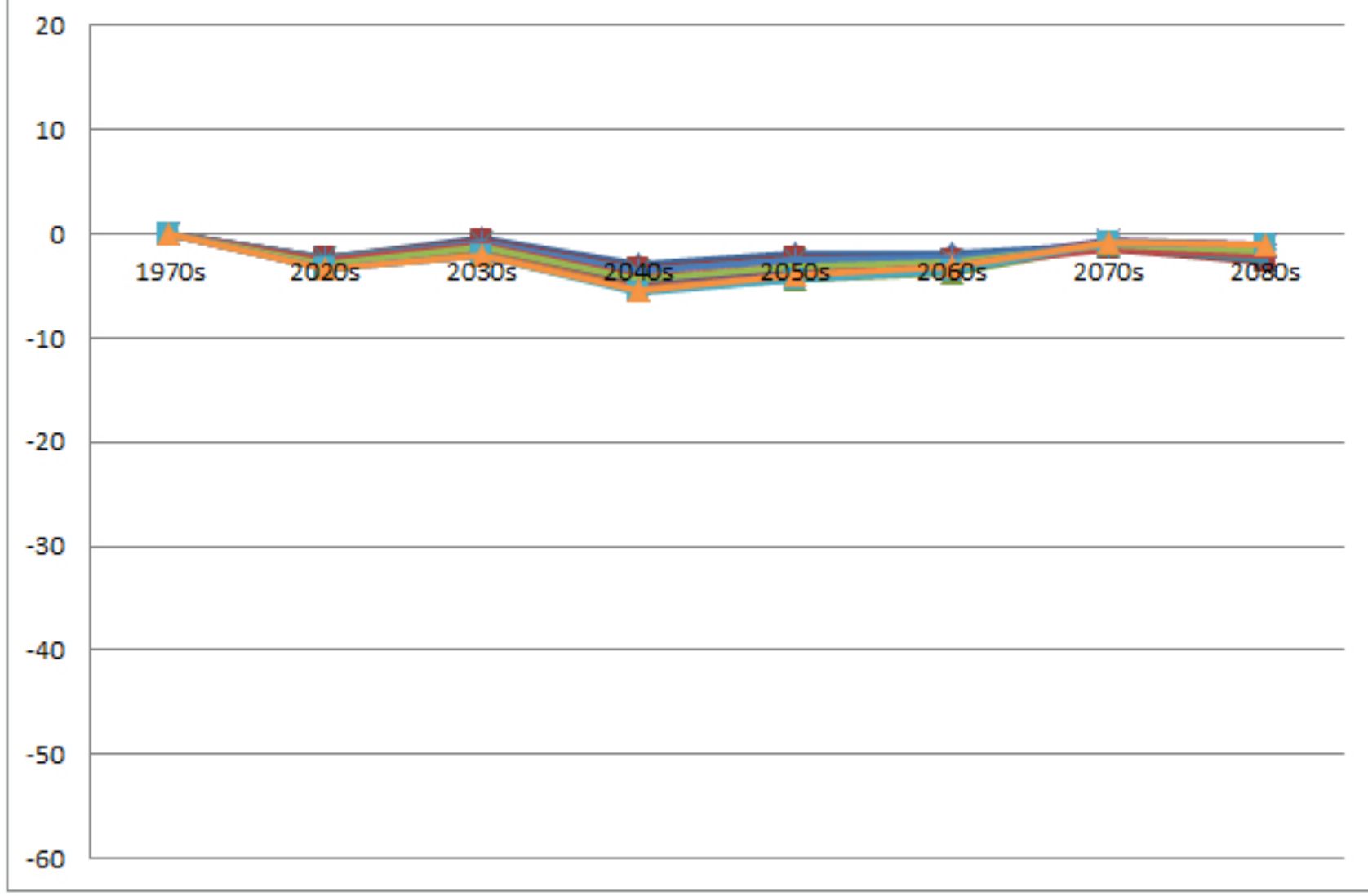
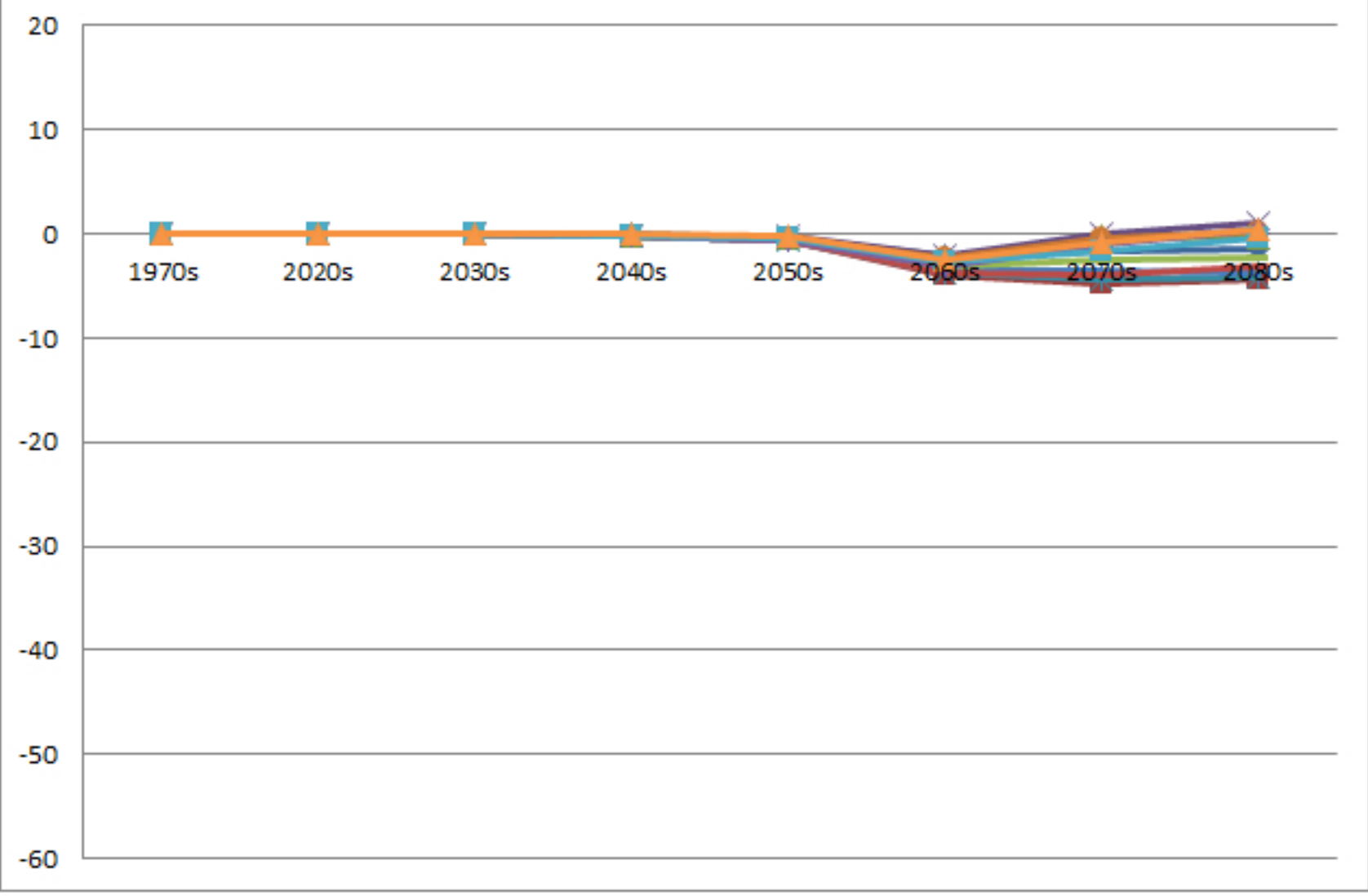
Recreation



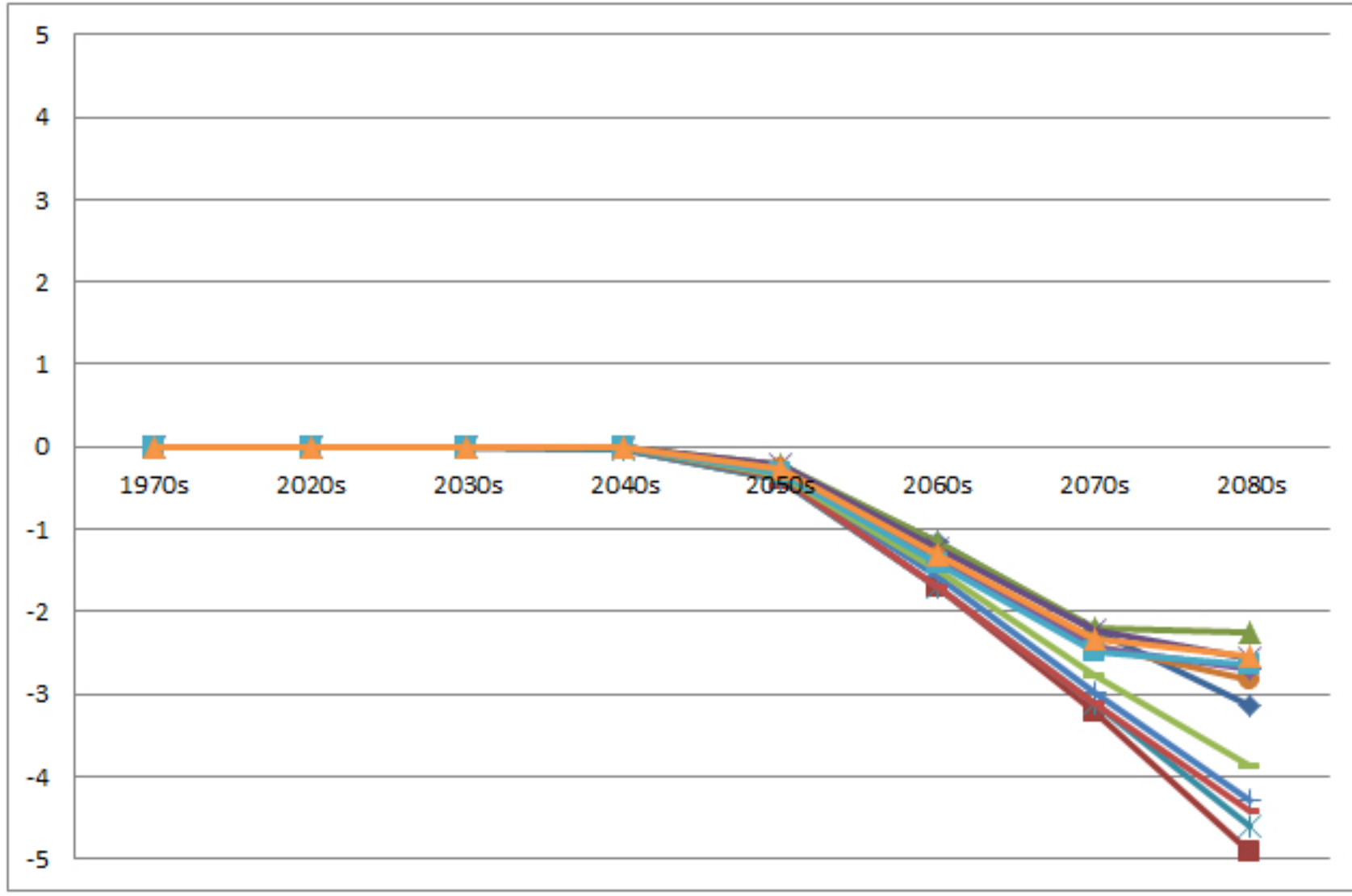
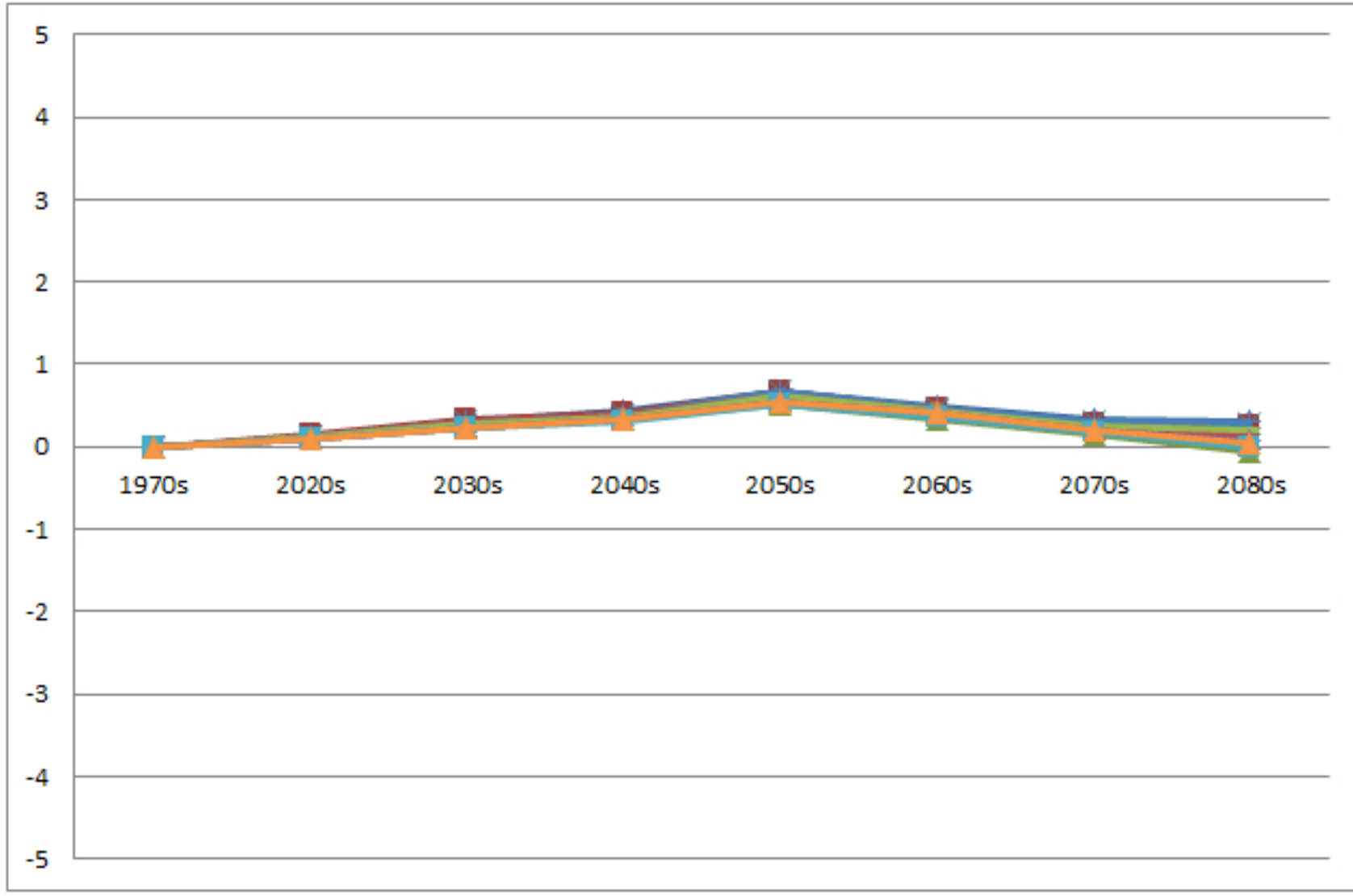
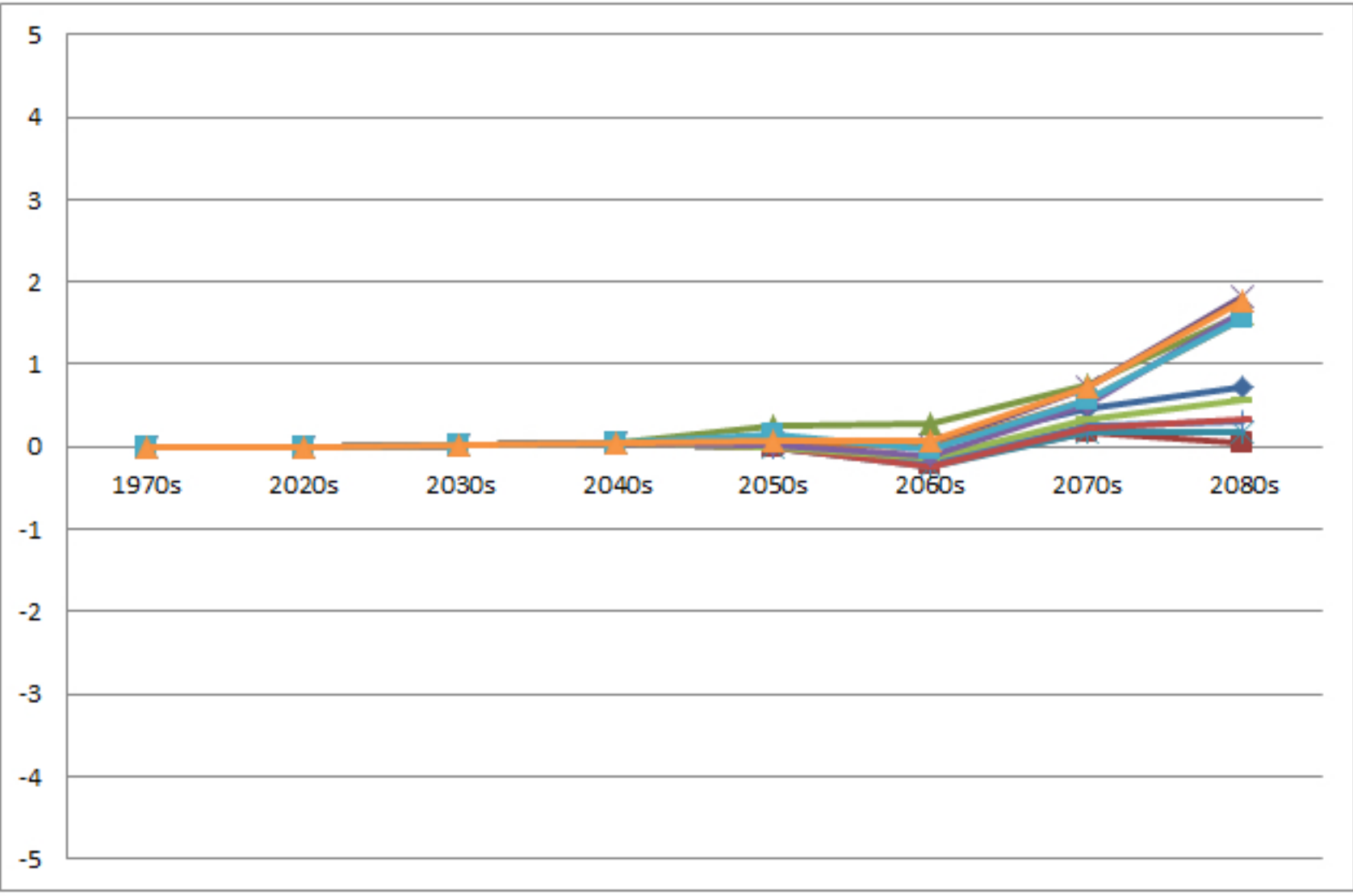
Suitability



TDC17+



Wind Risk



Gwydyr Forest

Business As Usual (BAU)

Absolute values

Diversity

Relative change to BAU

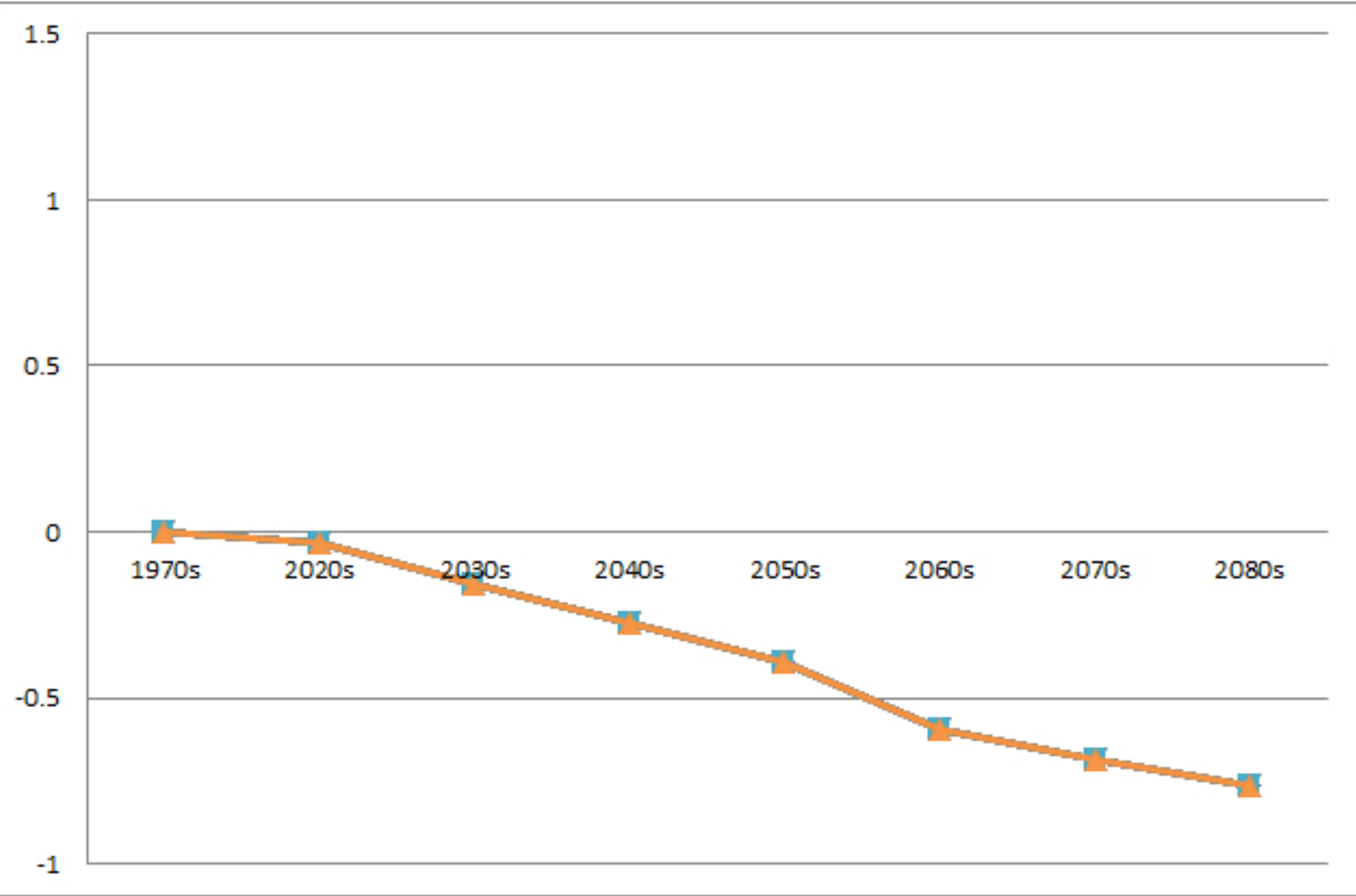
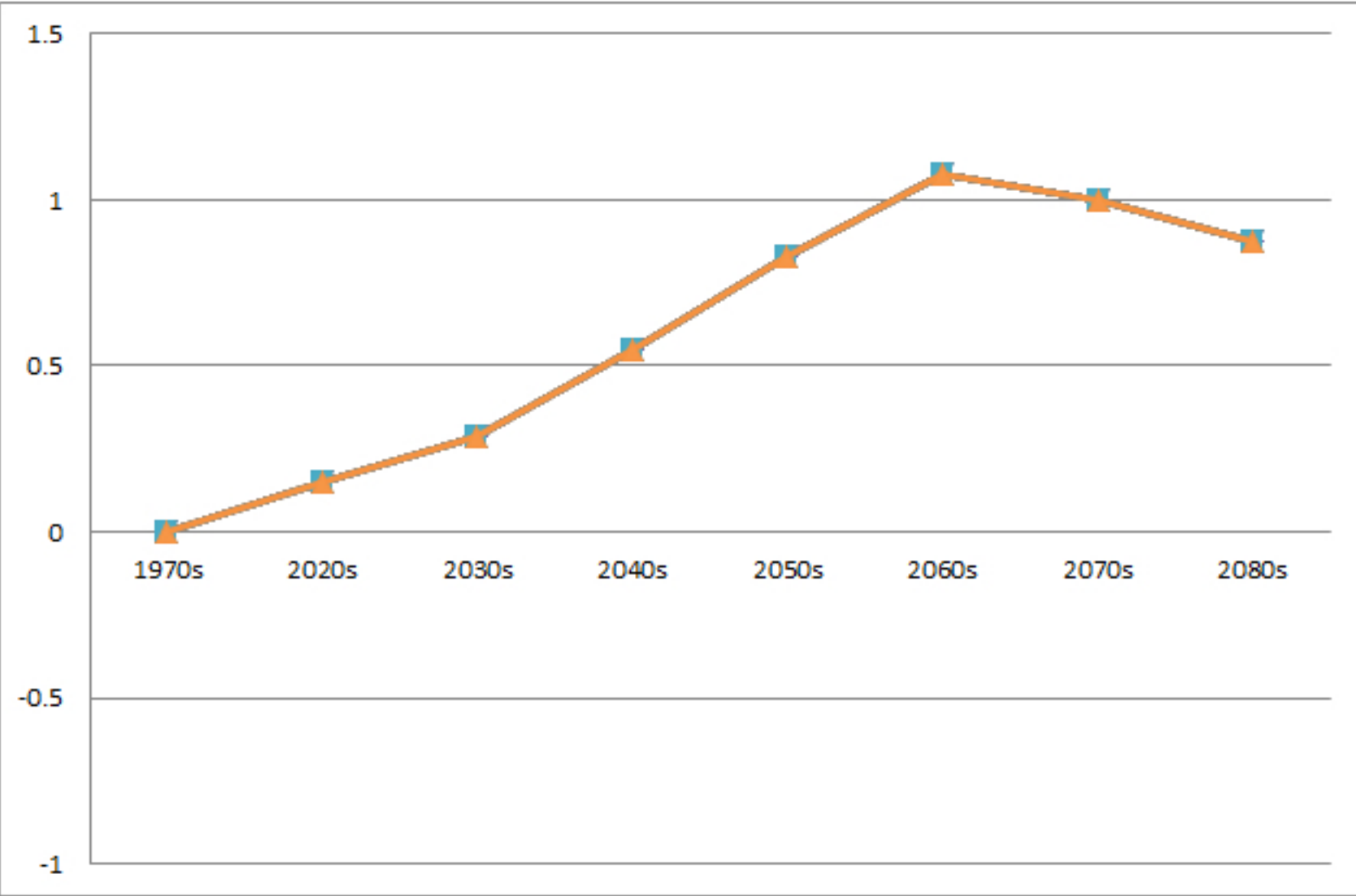
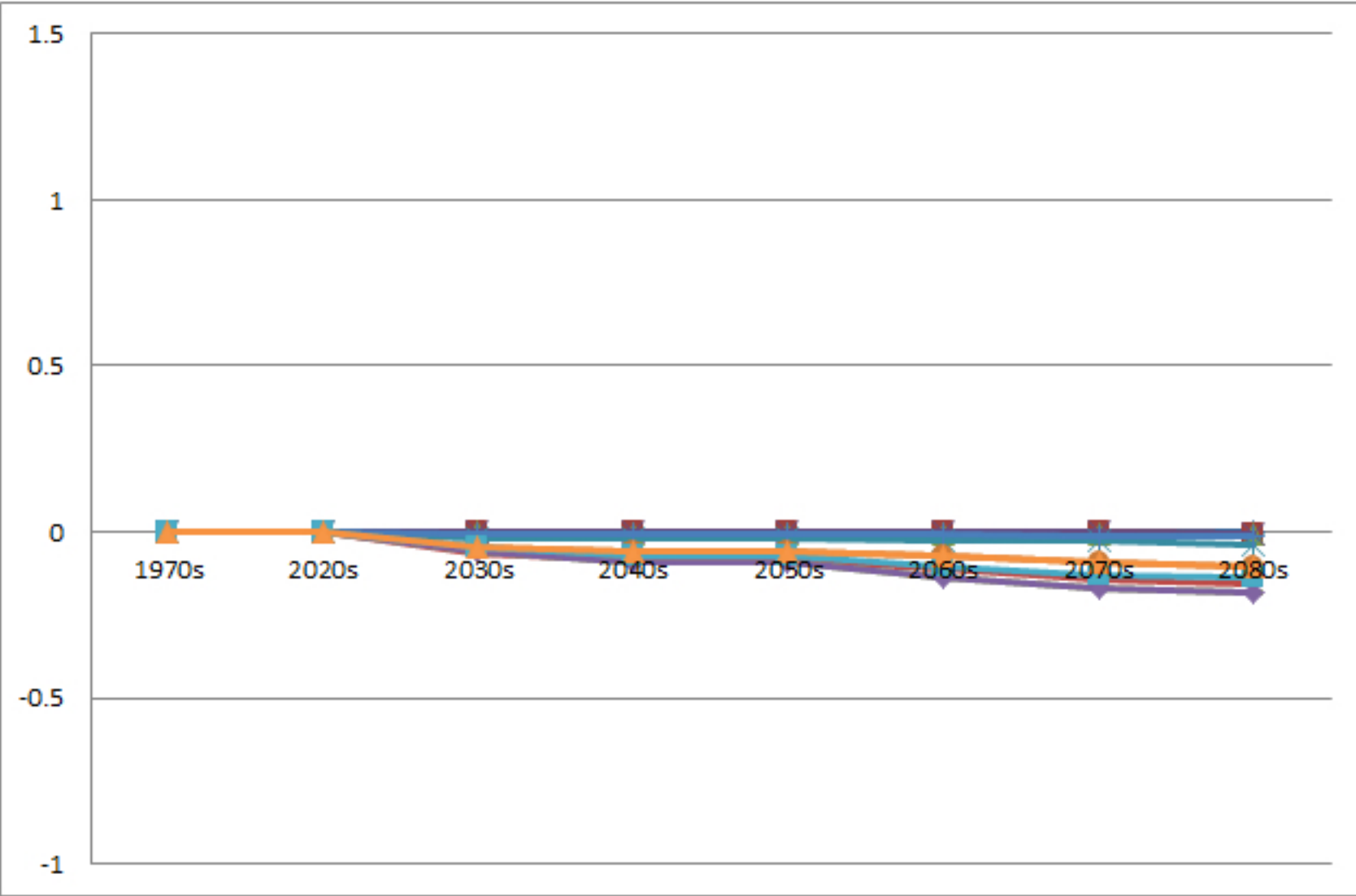
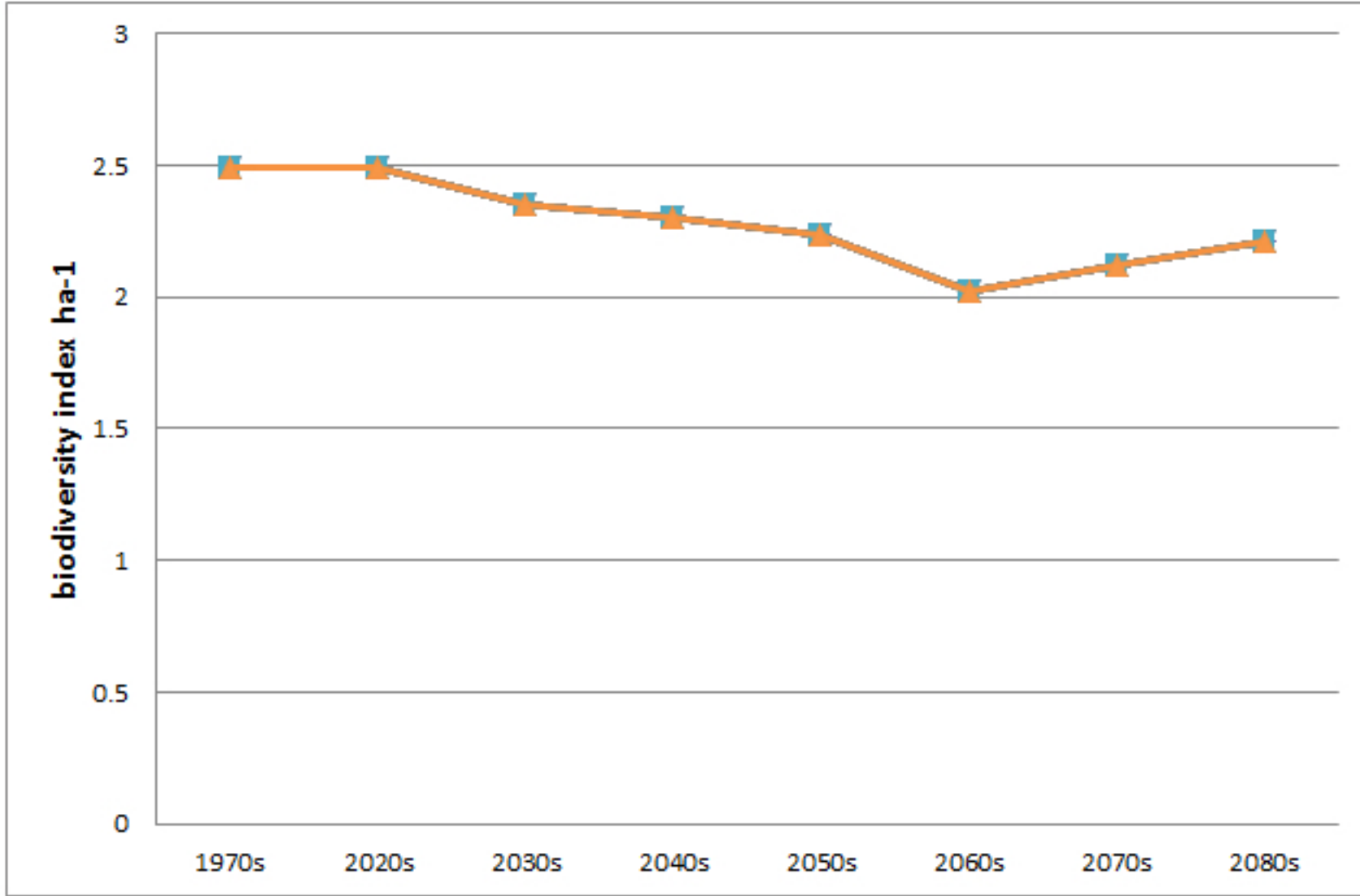
Low Impact Silvicultural Systems

Relative change to BAU

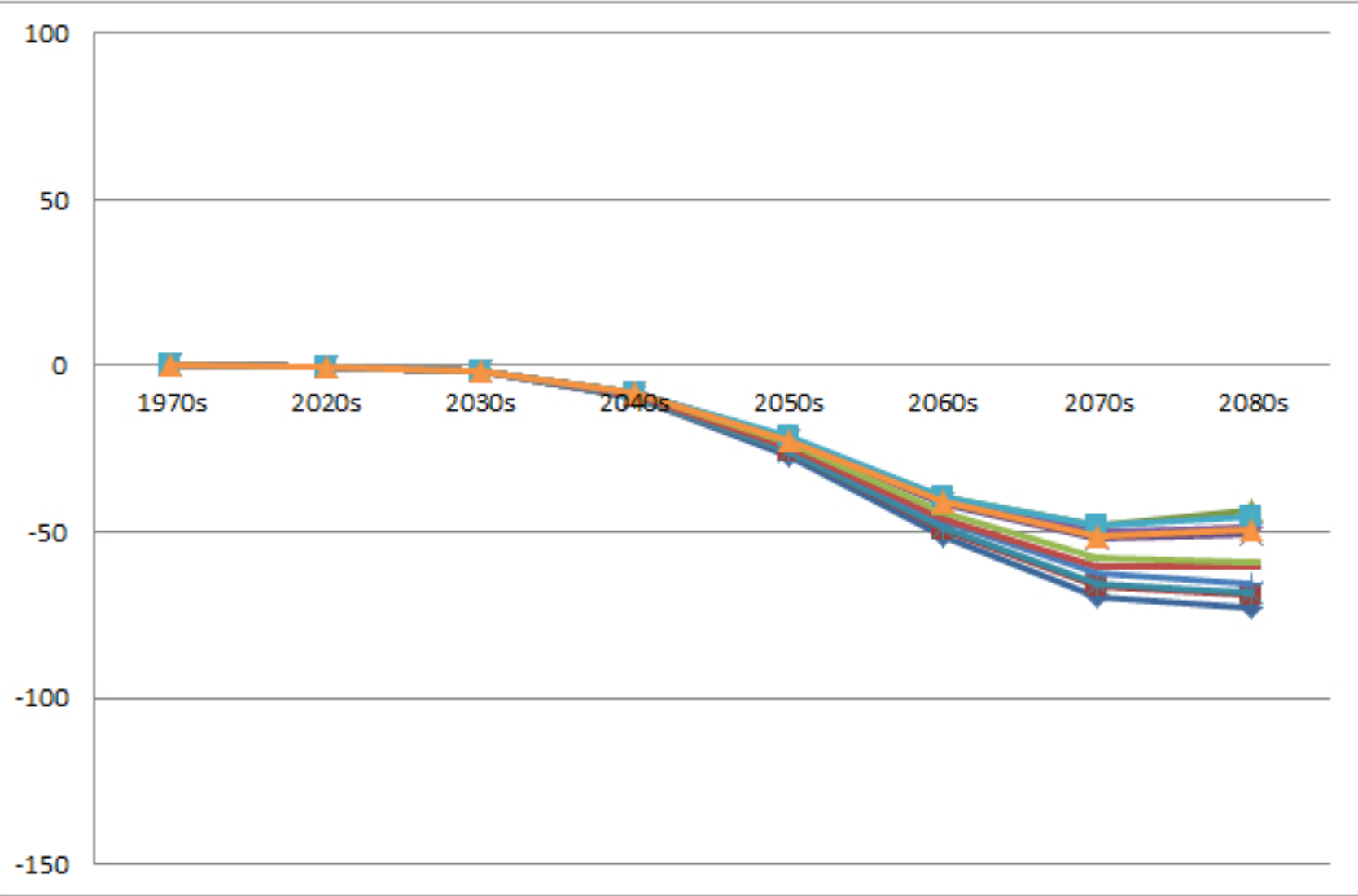
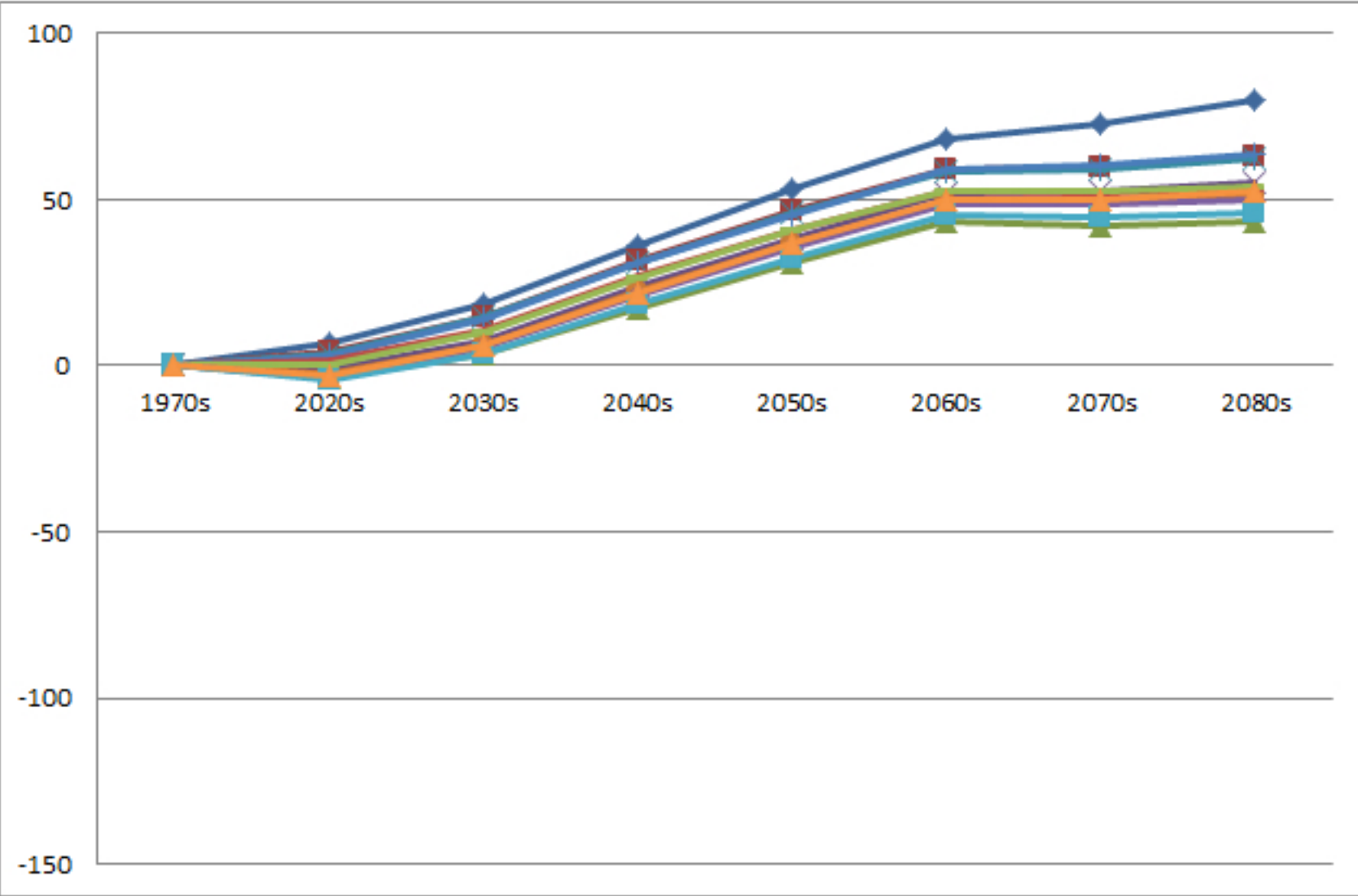
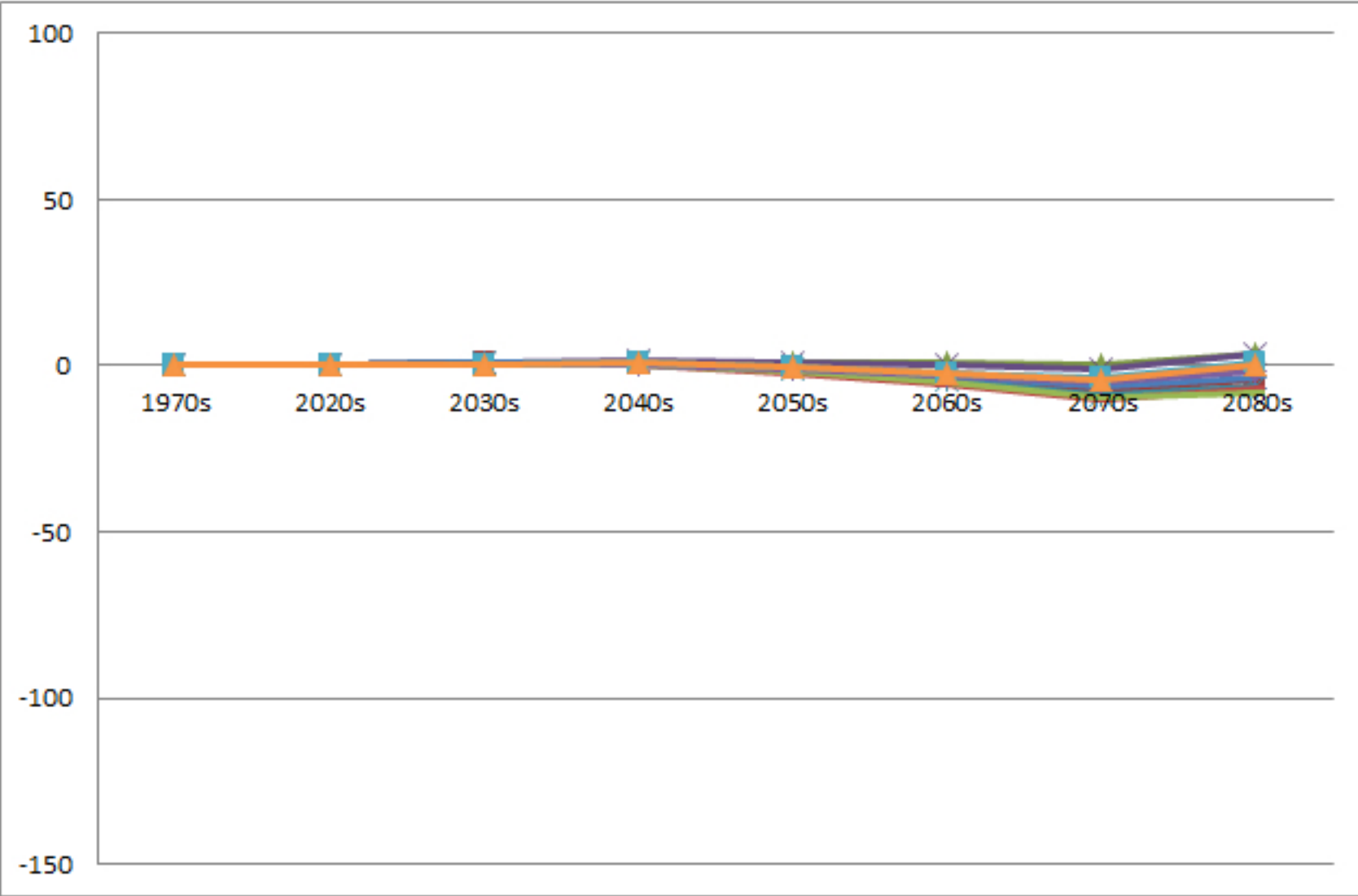
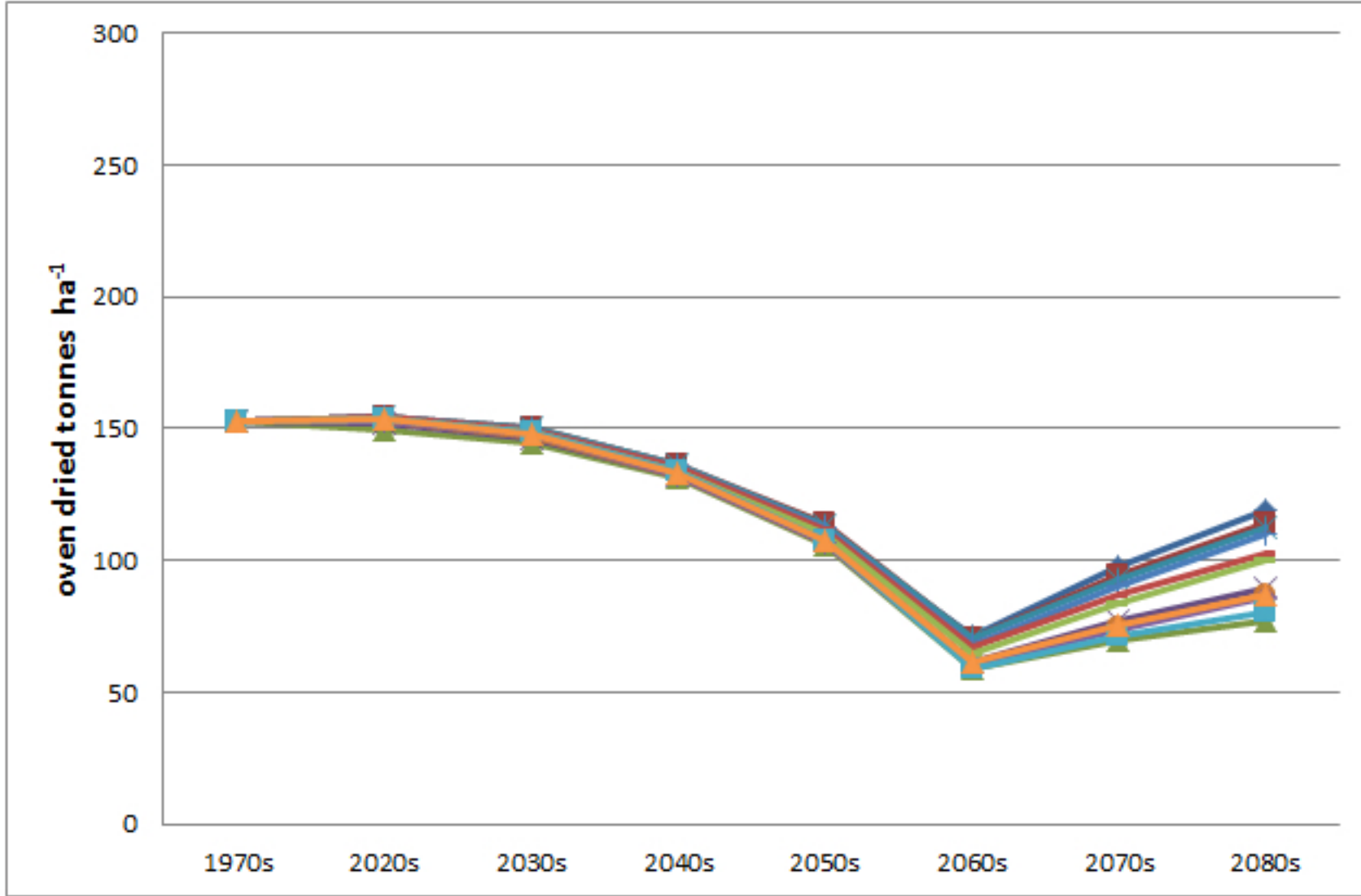
Short Rotation Forestry

Relative change to BAU

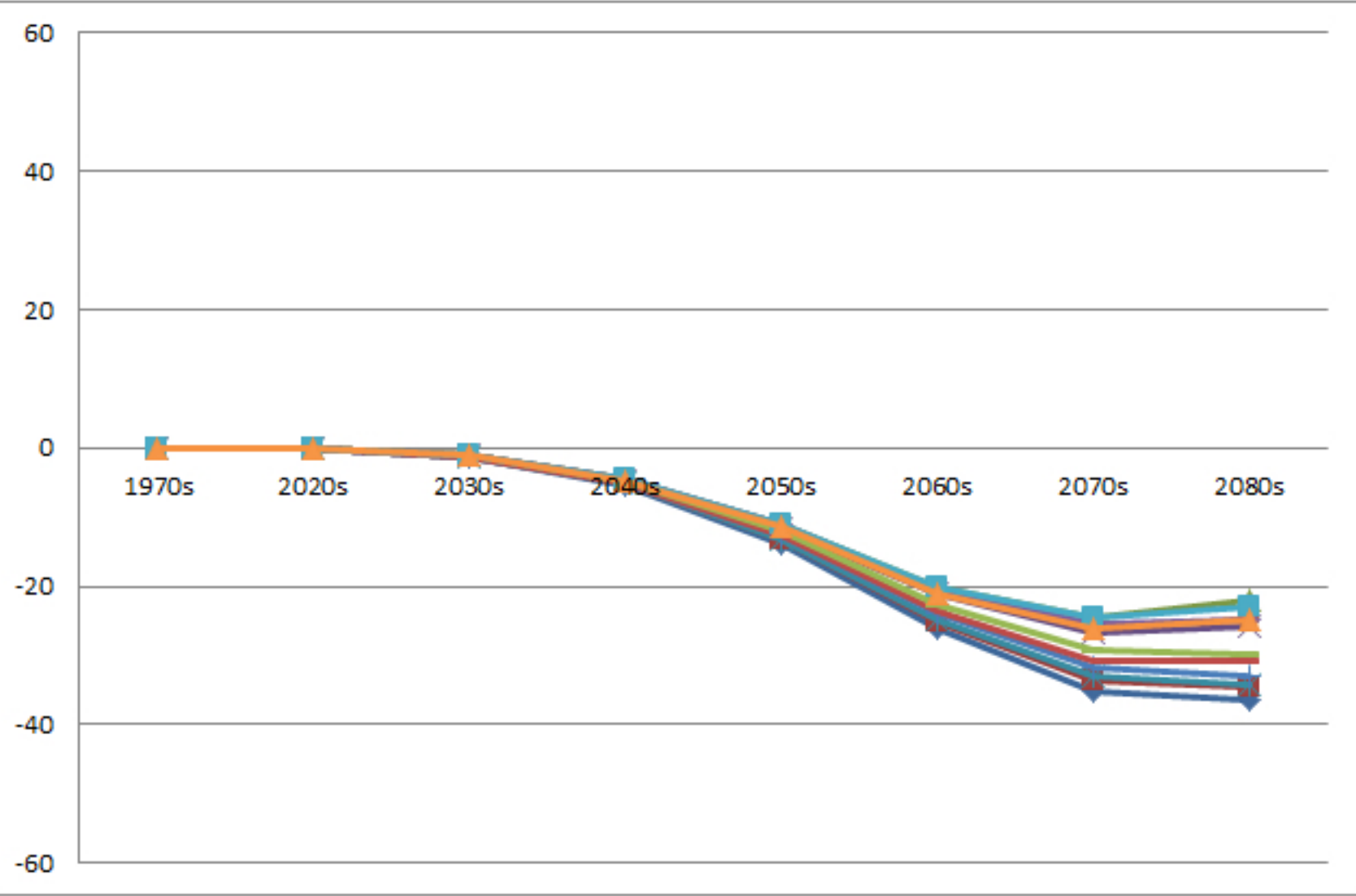
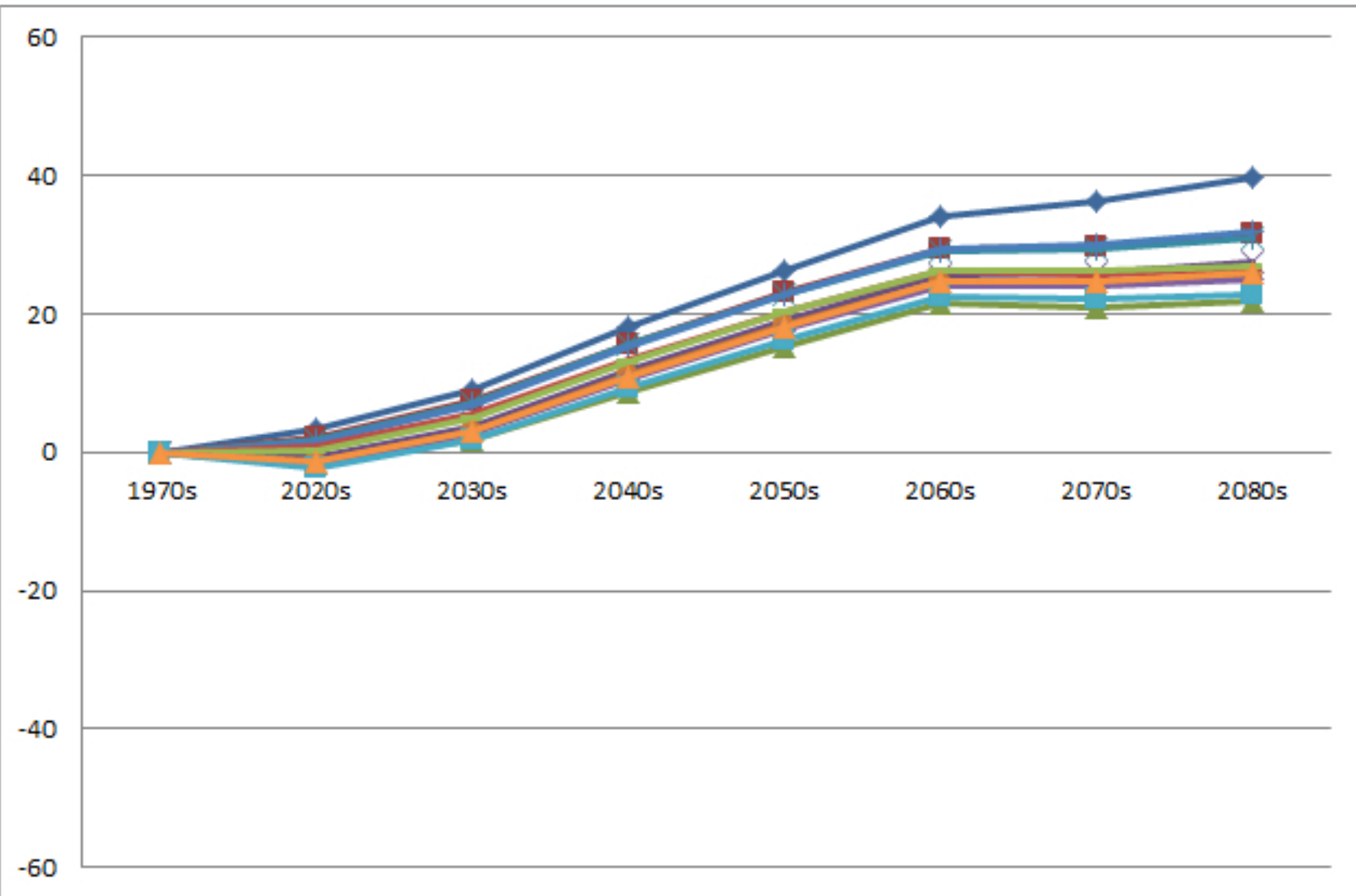
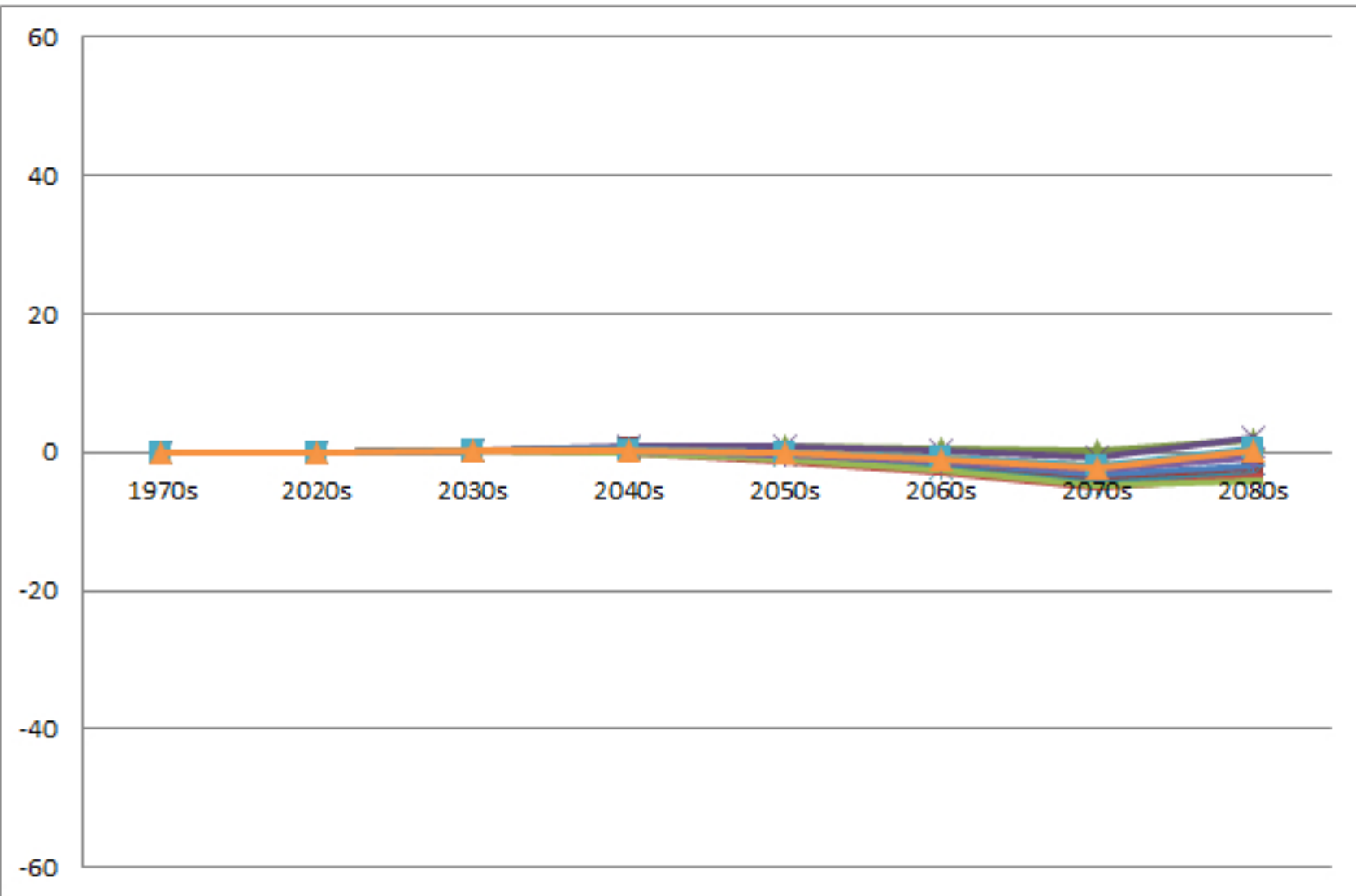
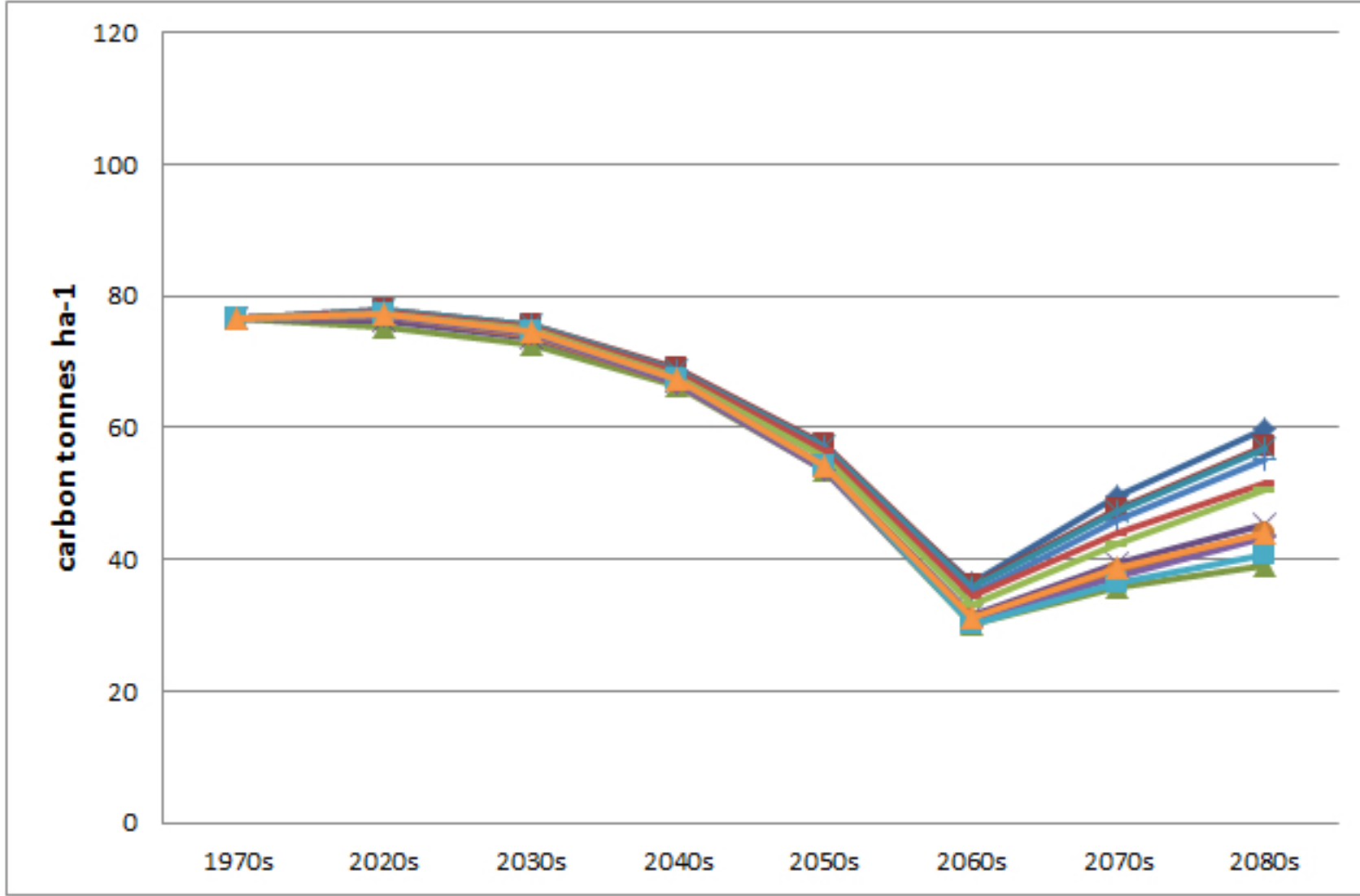
Biodiversity



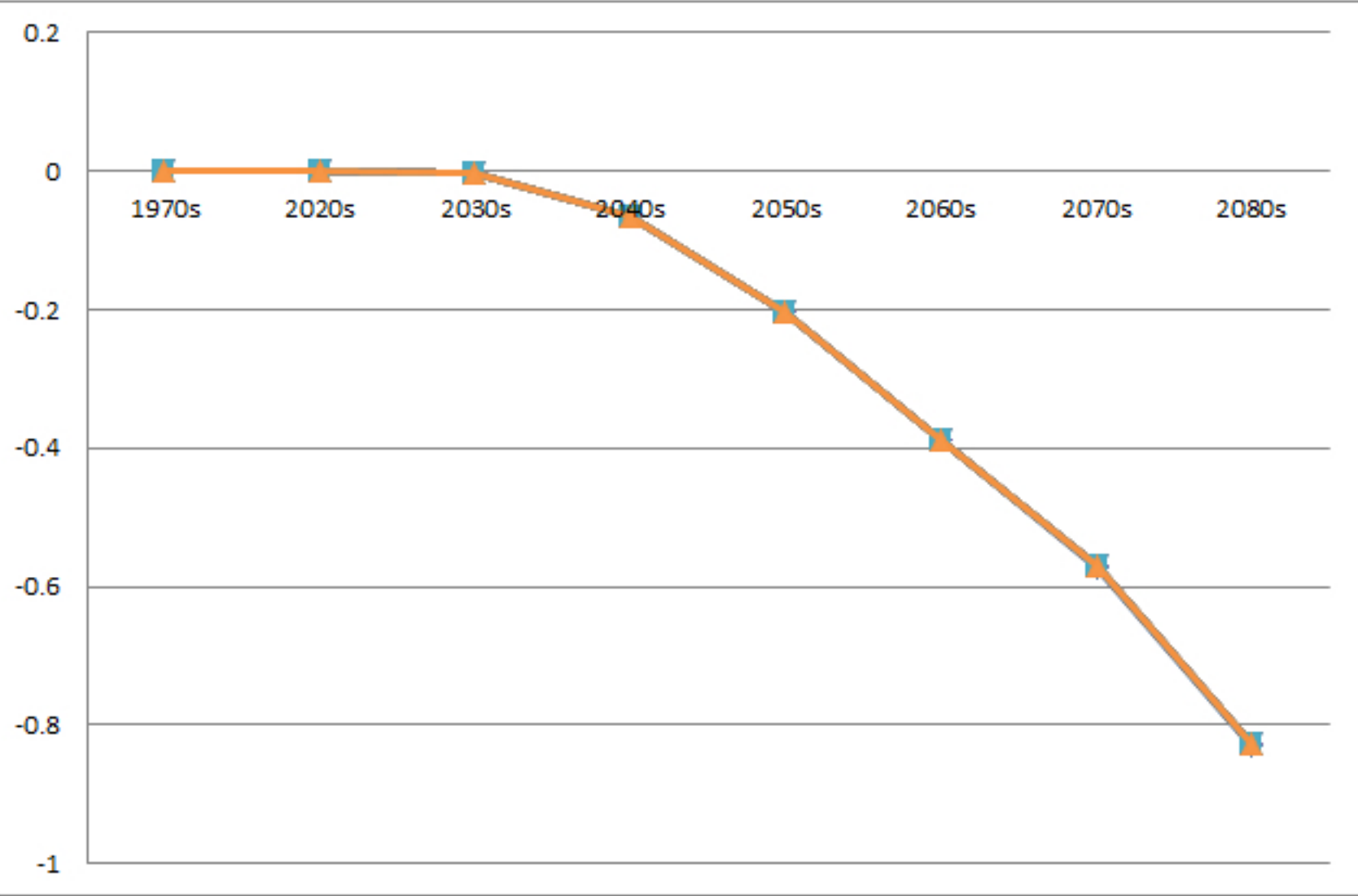
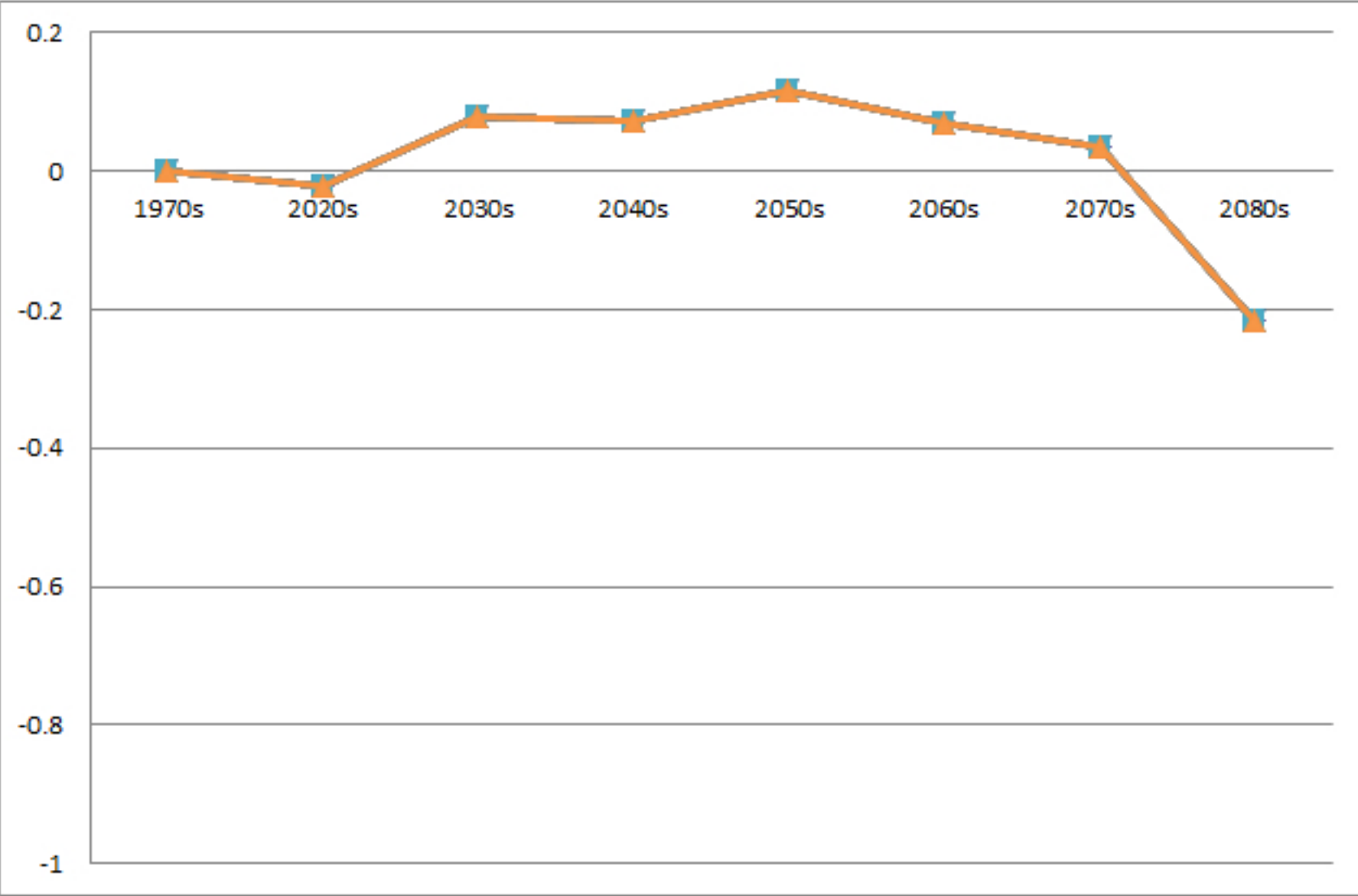
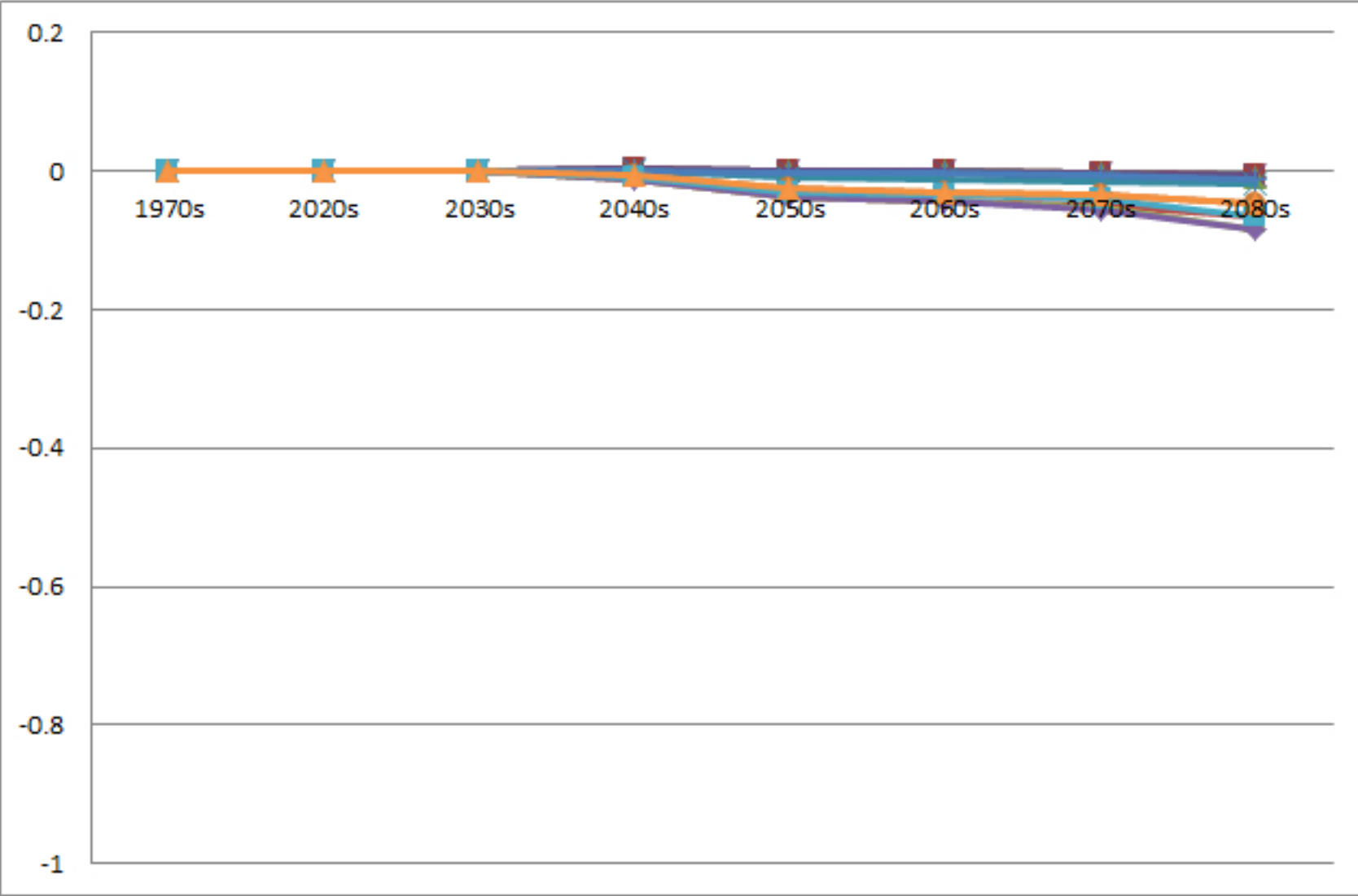
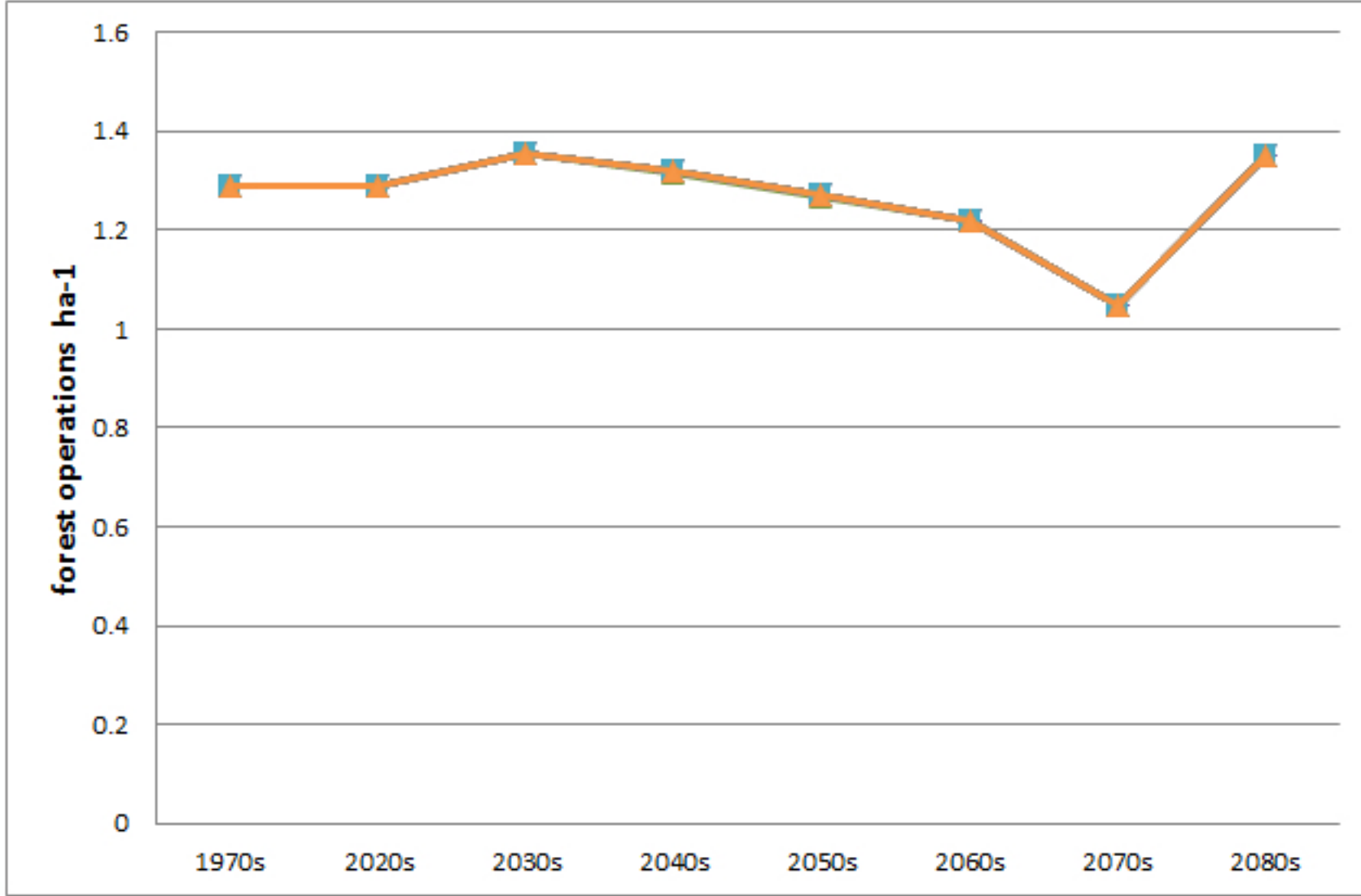
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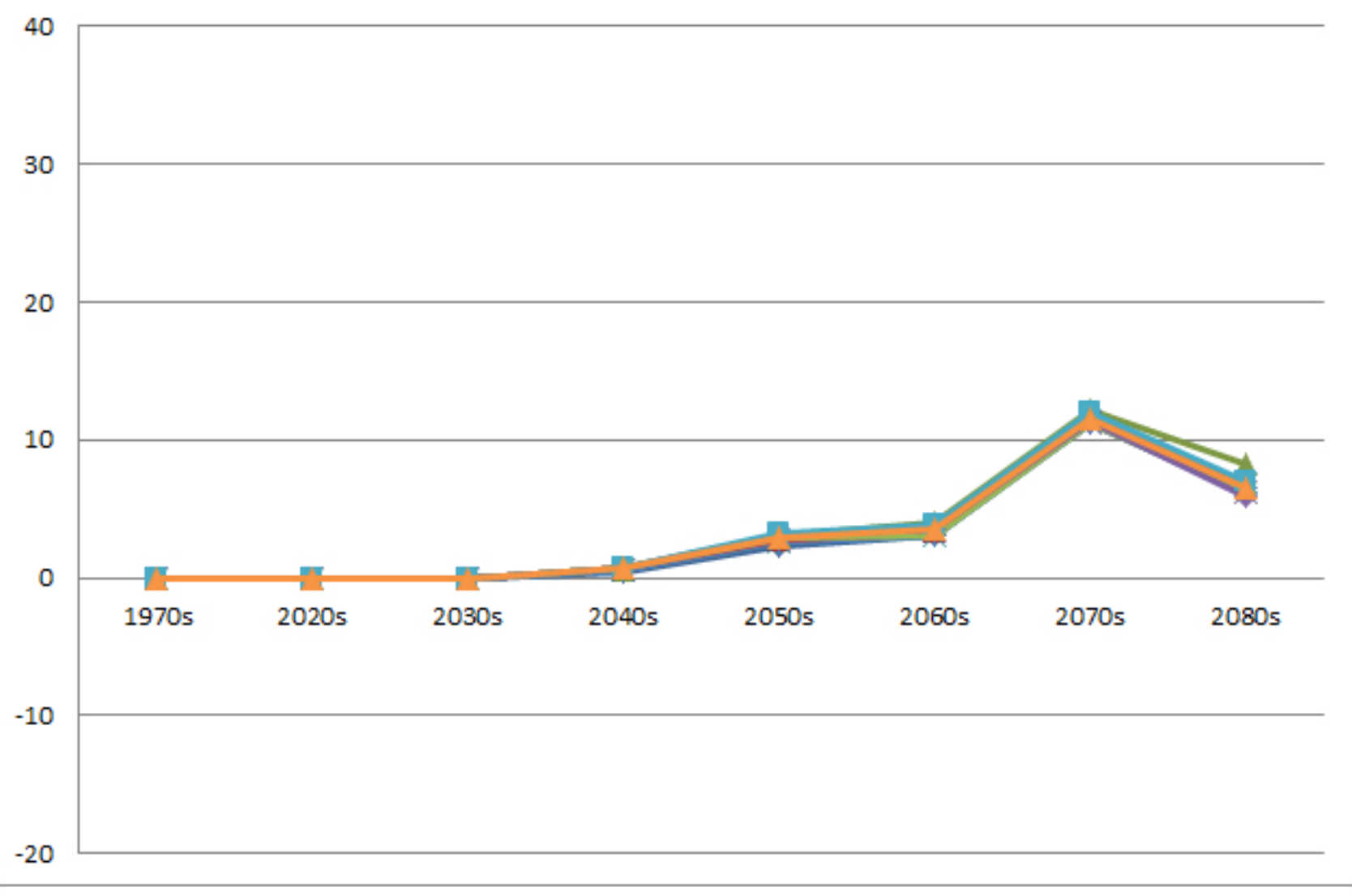
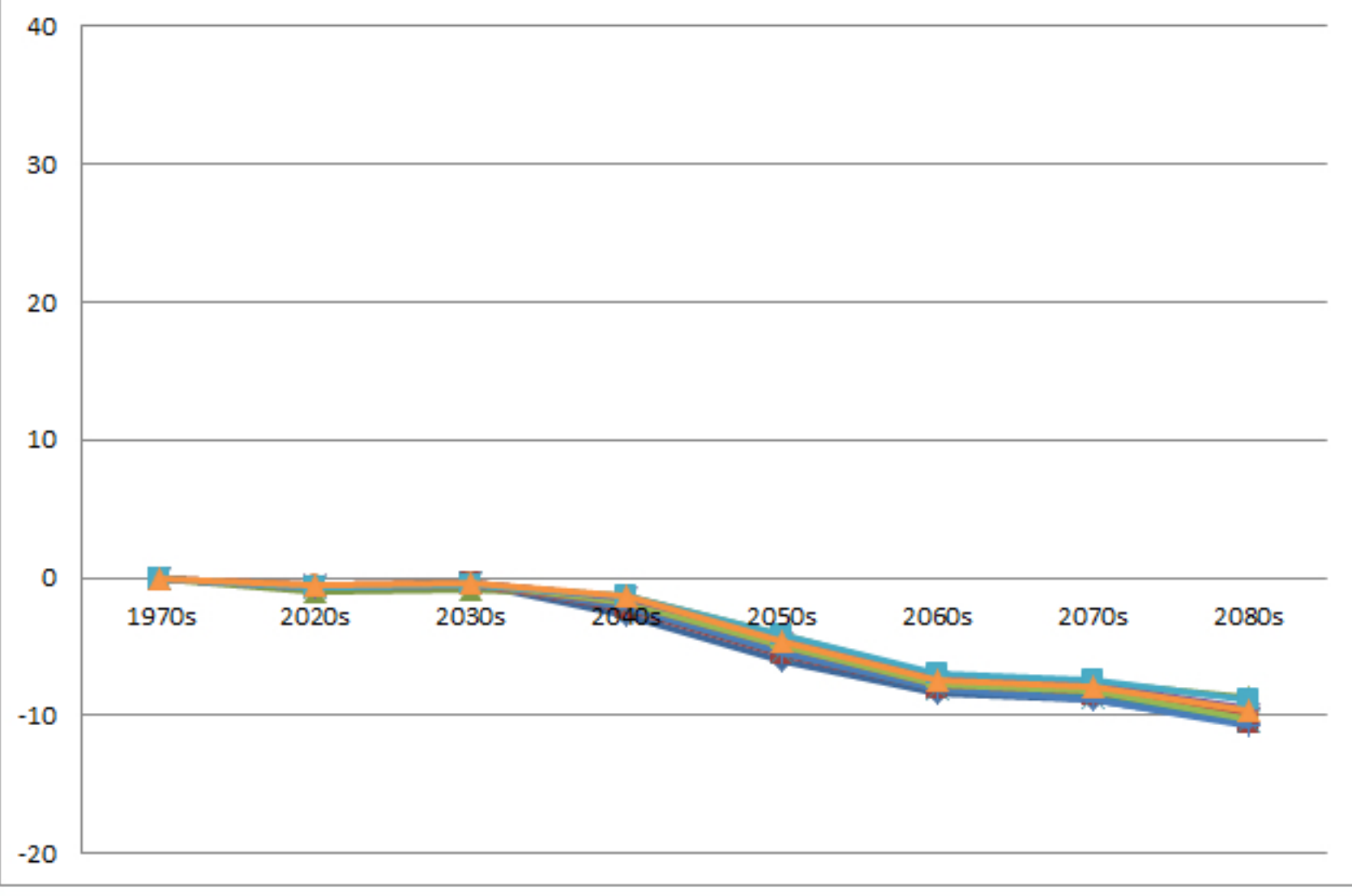
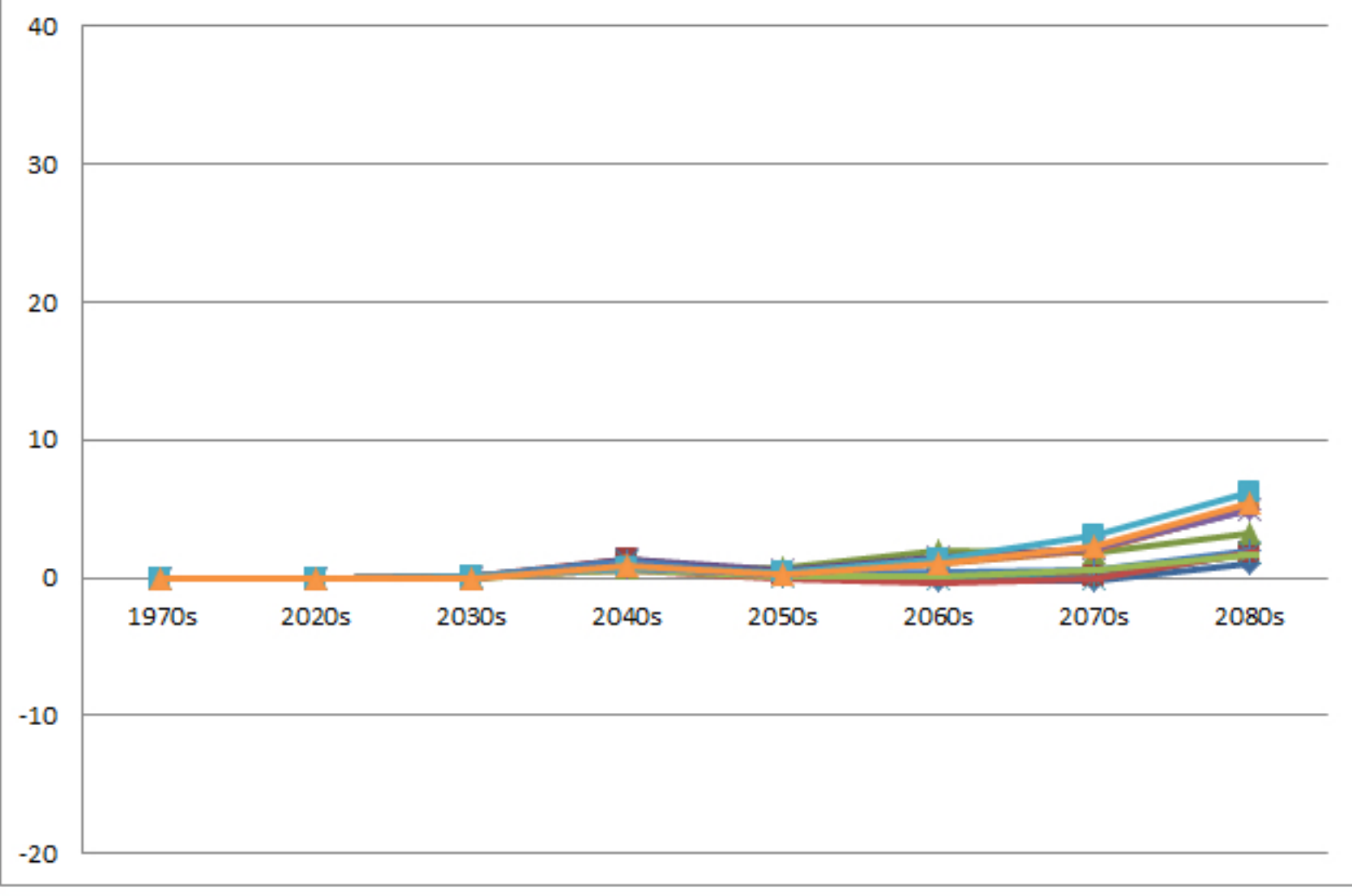
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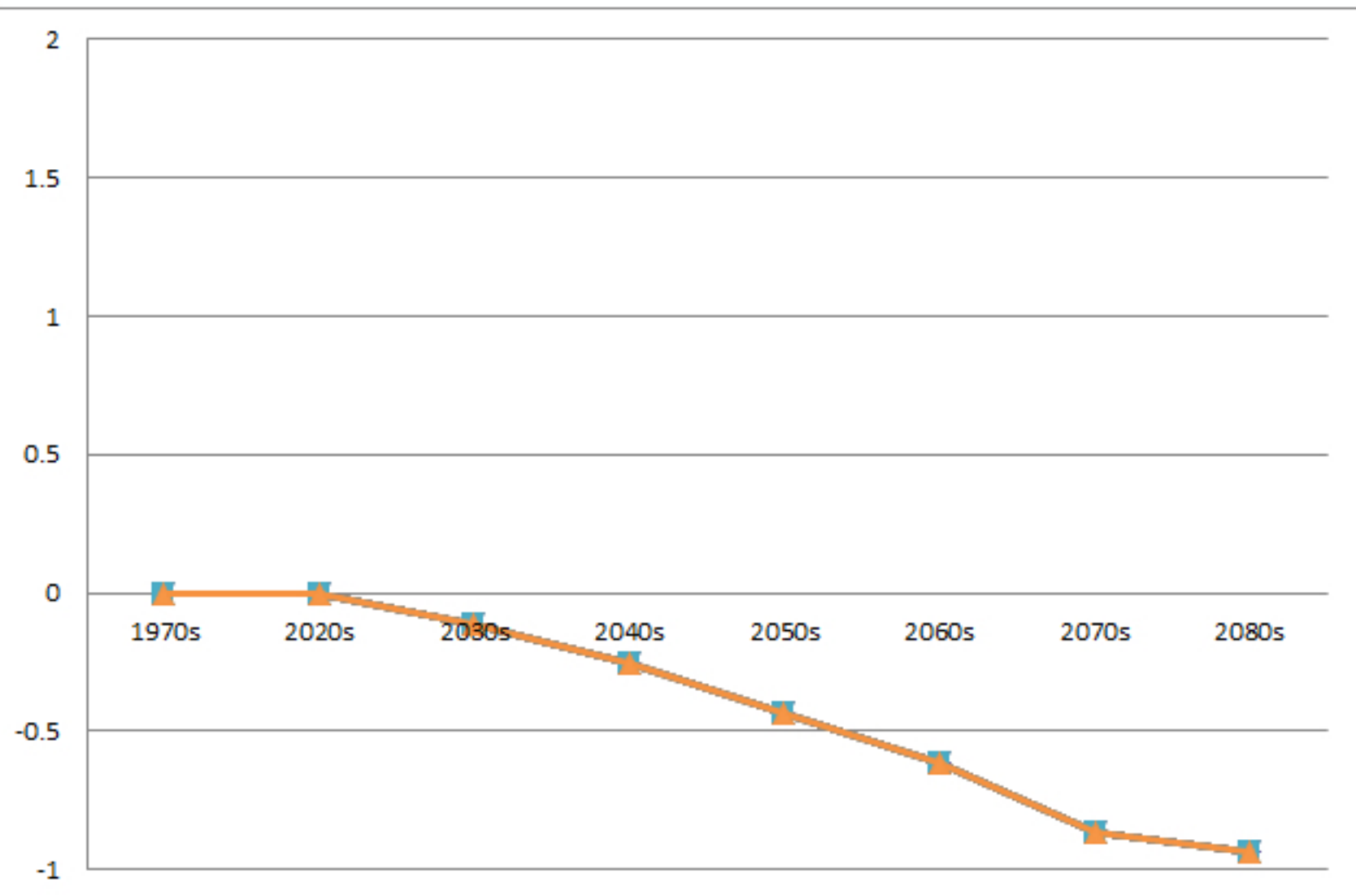
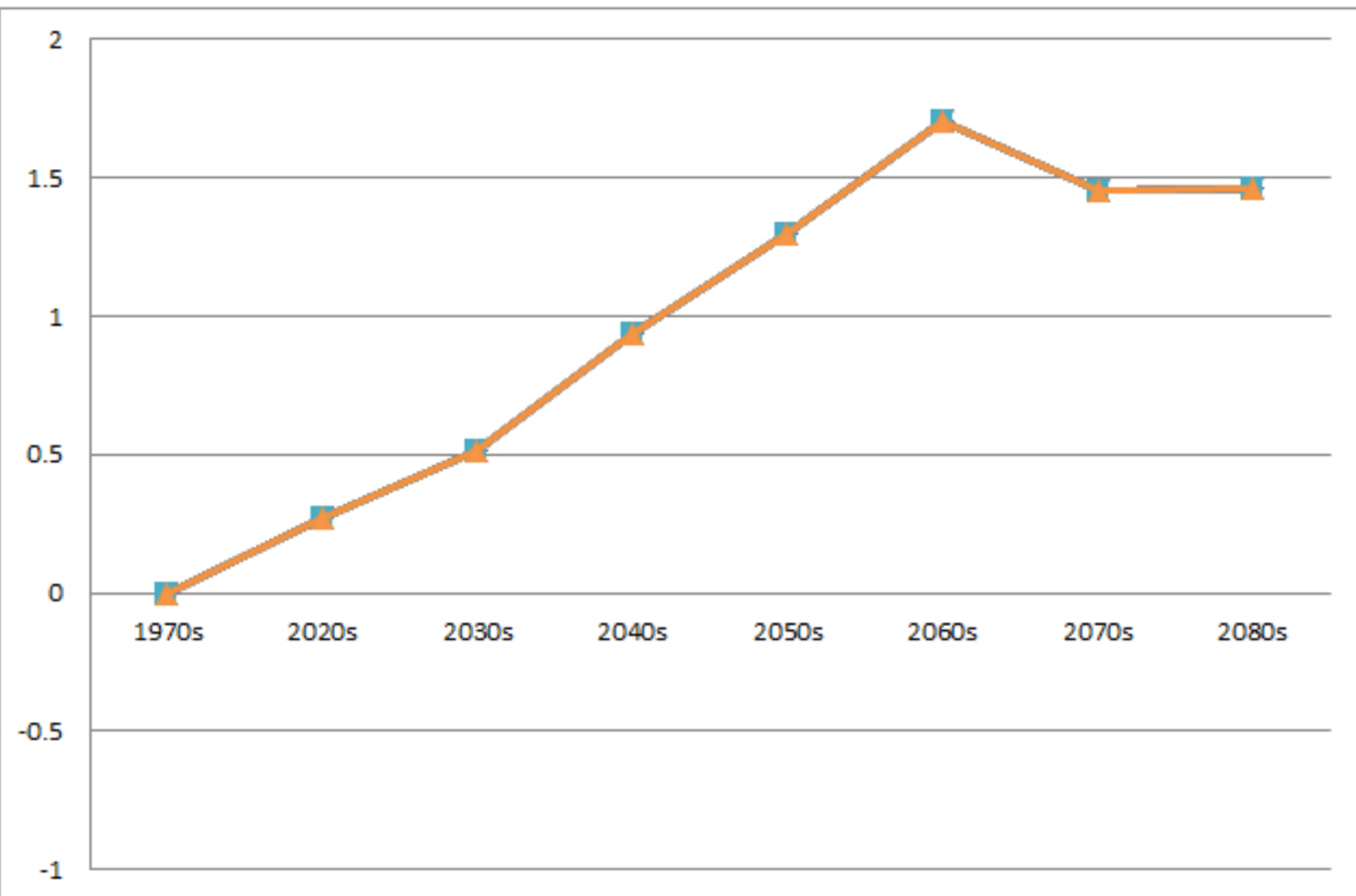
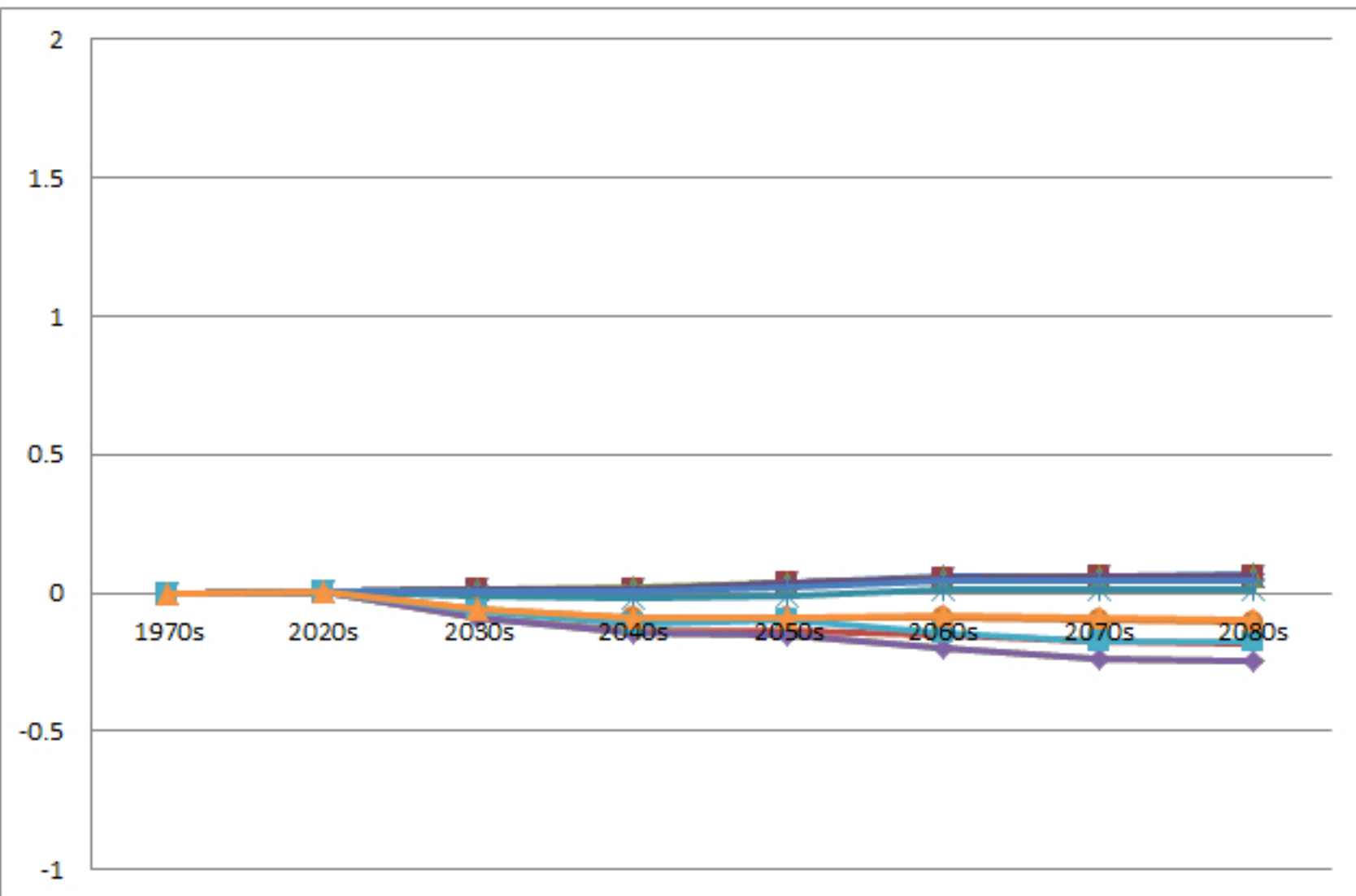
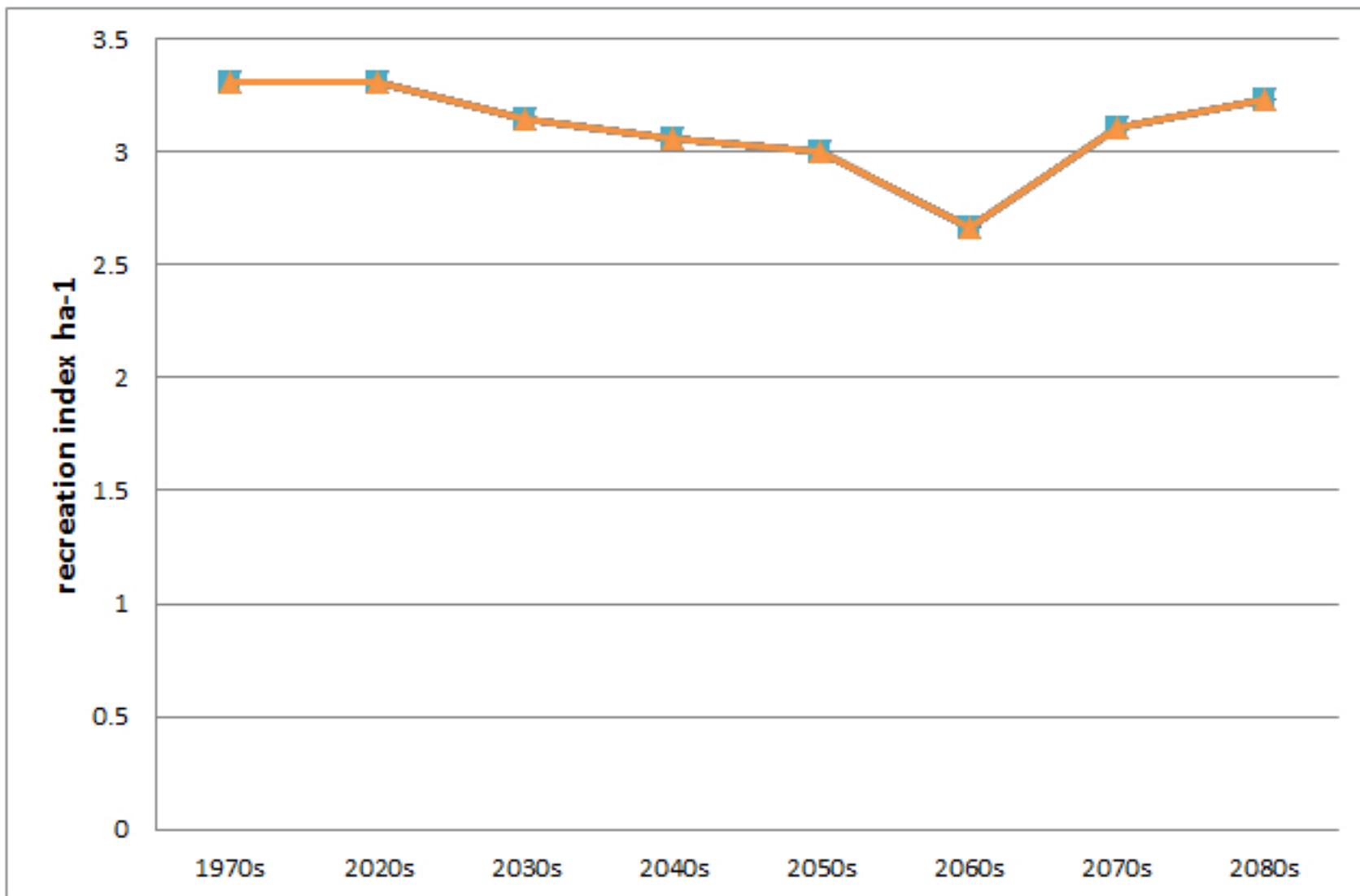
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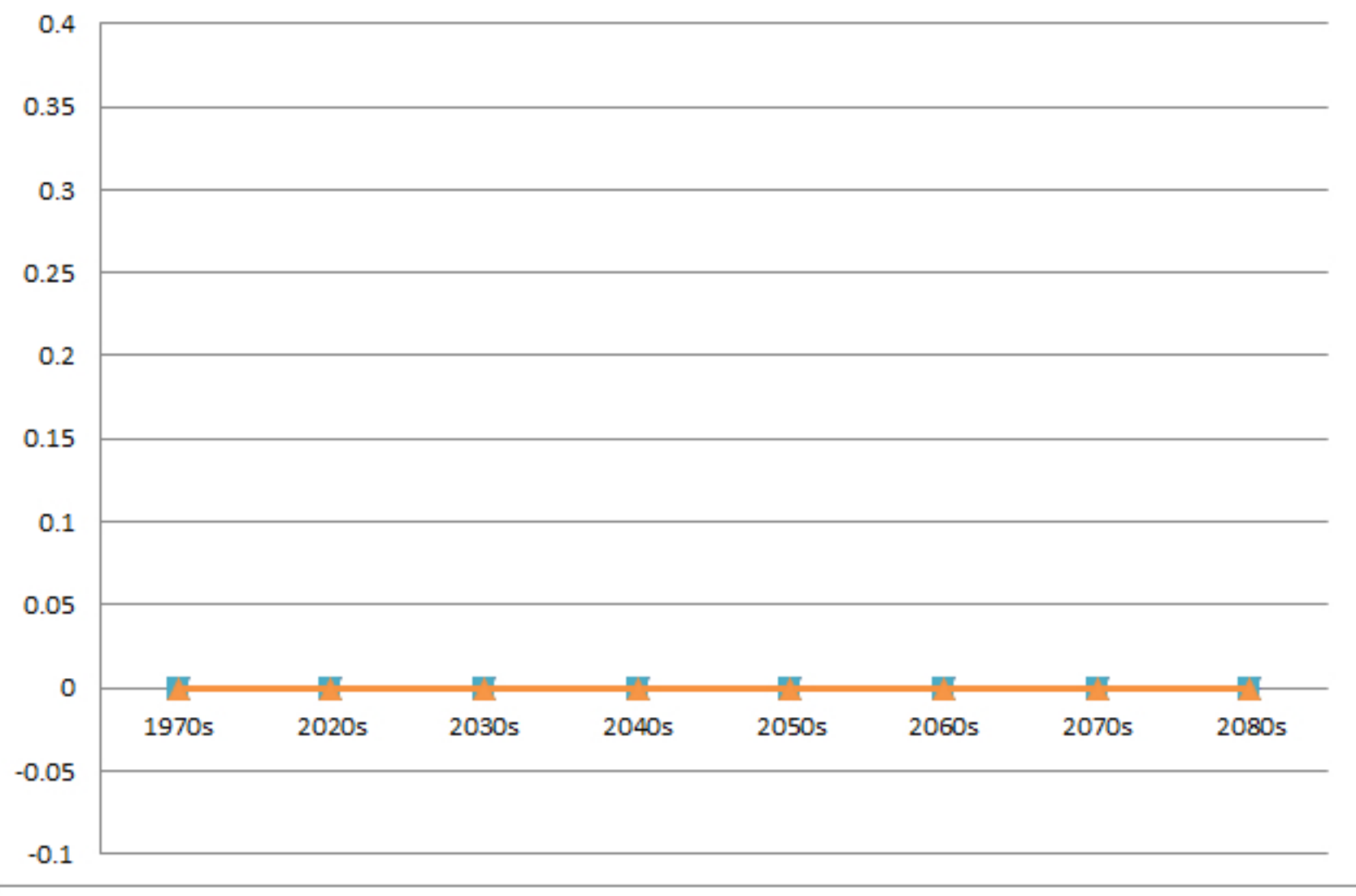
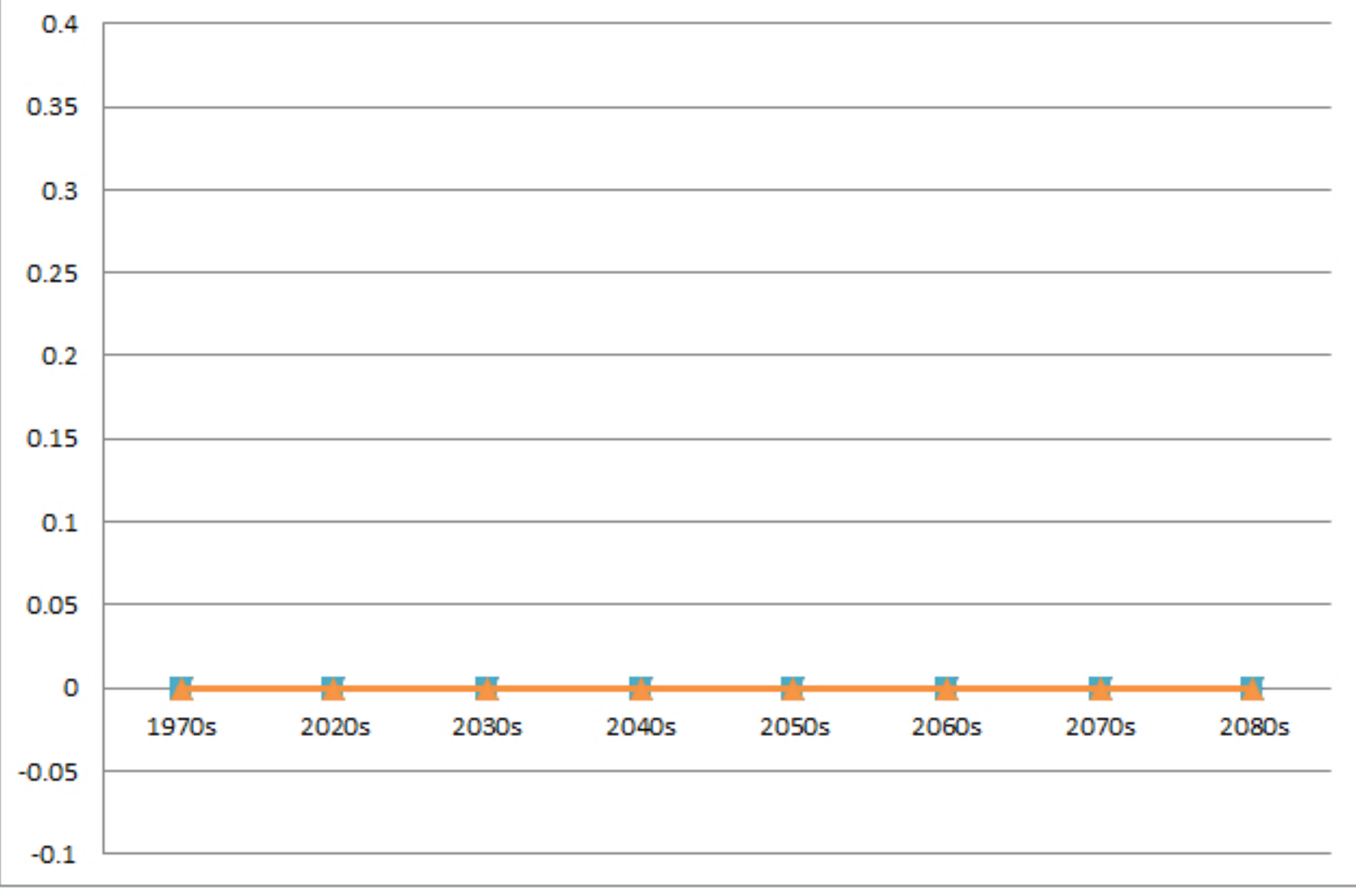
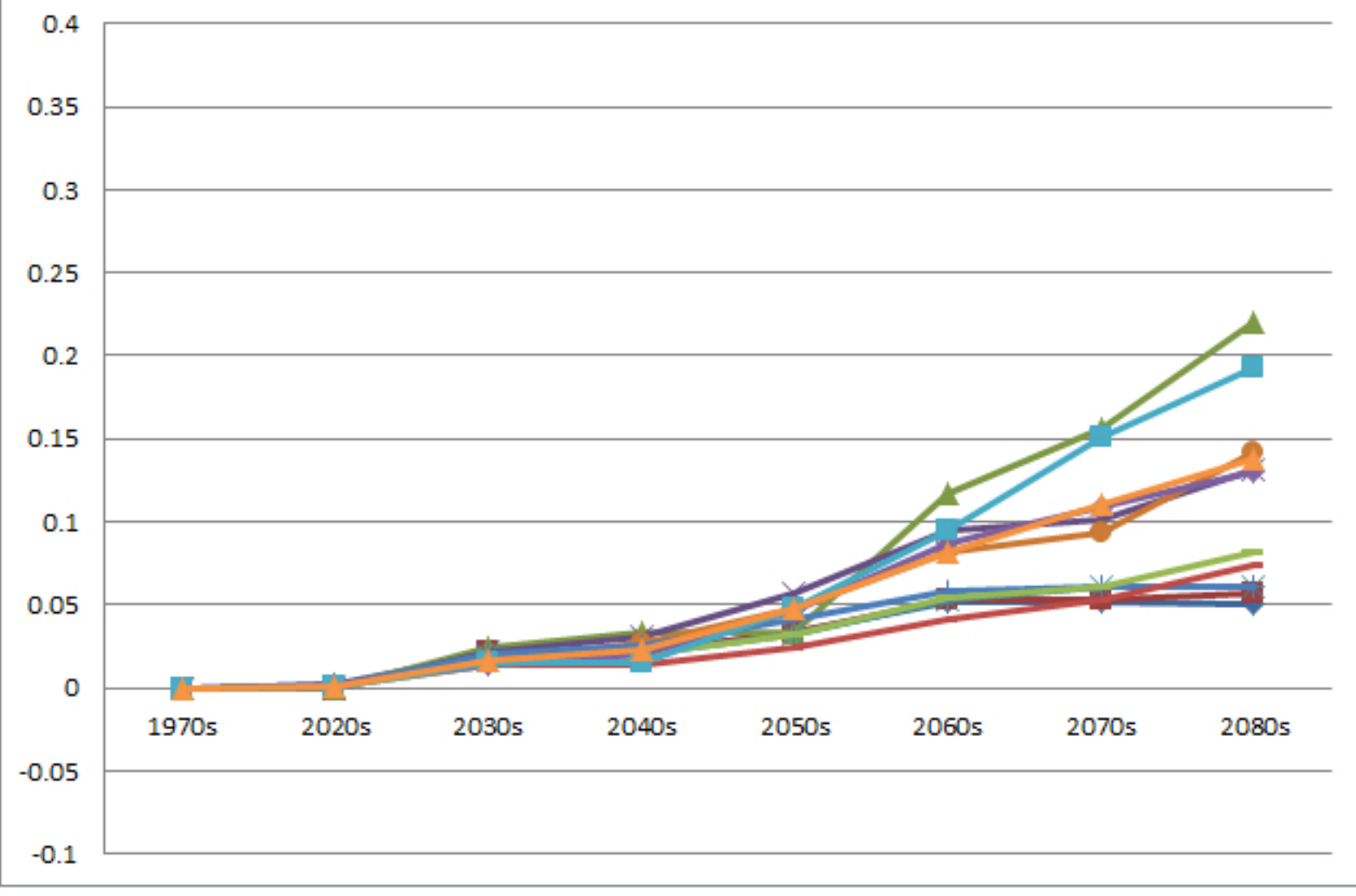
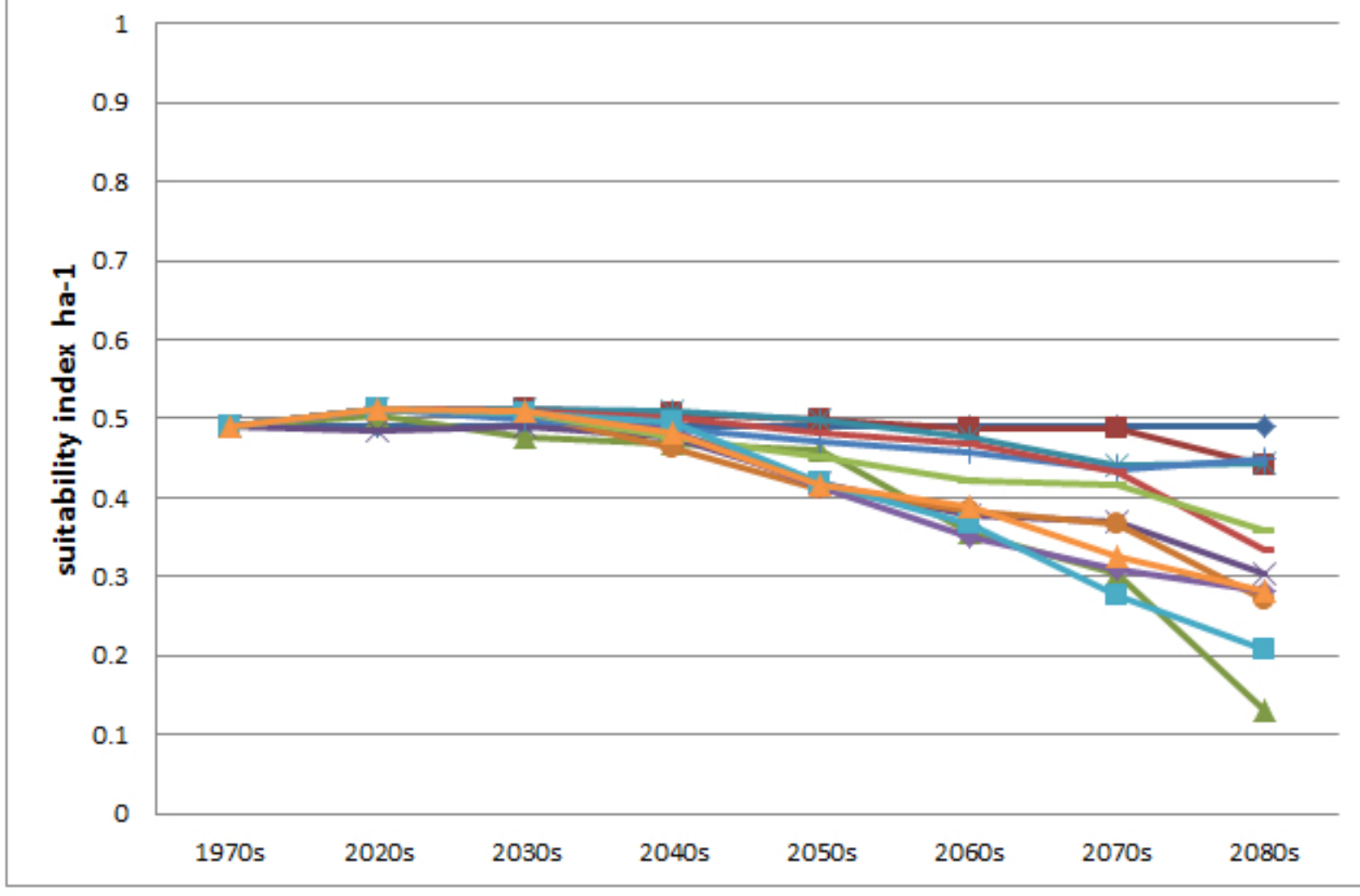
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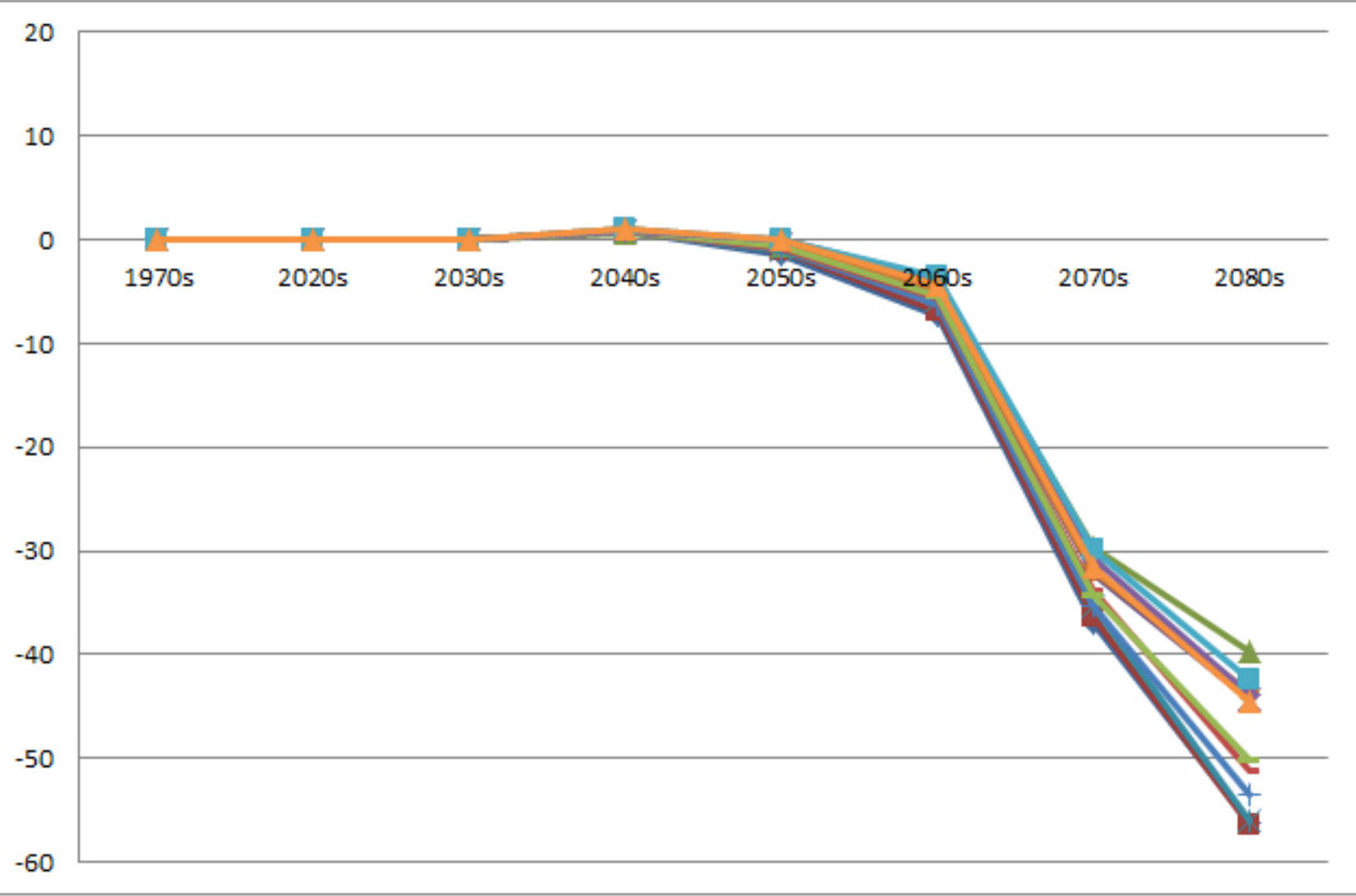
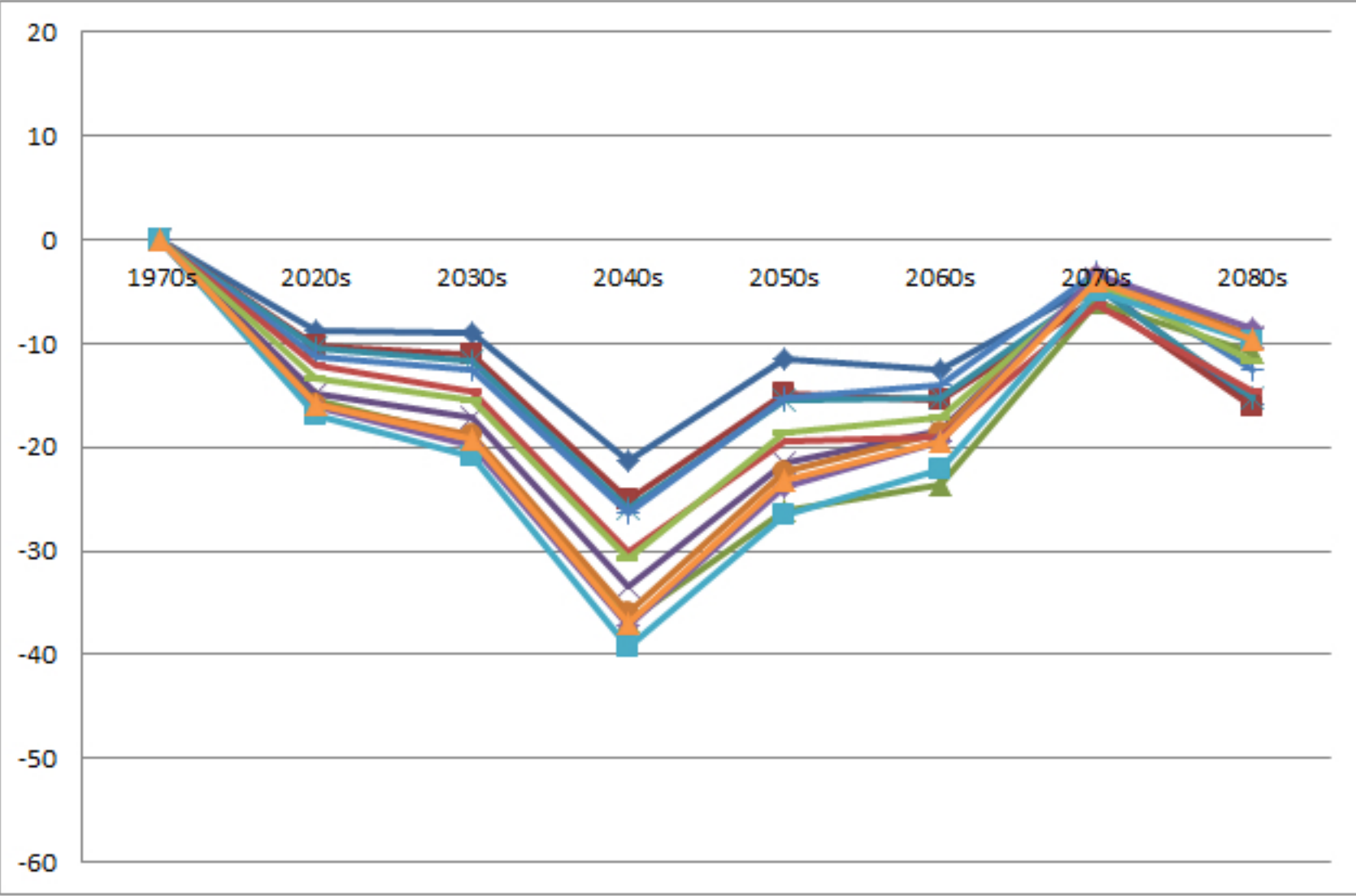
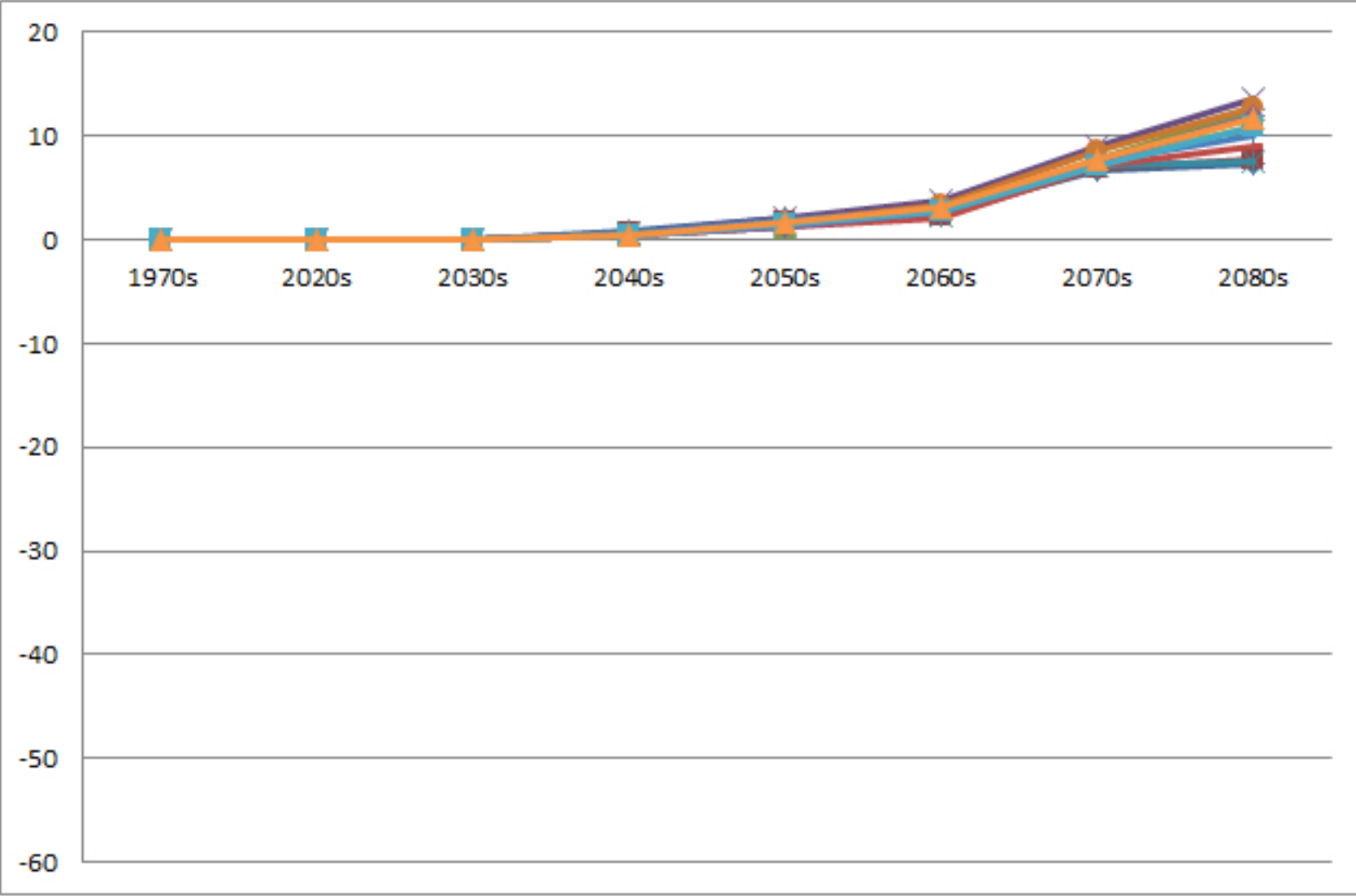
Recreation



Suitability



TDC17+



Wind Risk

