

# Economic analysis of individual behavior for sustainability

How do individual behave in intergenerational sustainability dilemma?  
A strategy-method experiment

Mostafa Shahen

Ph.D. Candidate

Kochi university of technology

# Motivation

- Competition among individuals became more stiff in the current societies especially in cities.
- The population in cities exceeded the rural area for the first time in mankind history in 2008 (Mitchell, 2013).
- The life in cities encourages people to become more individualistic (Shahrier, 2016).

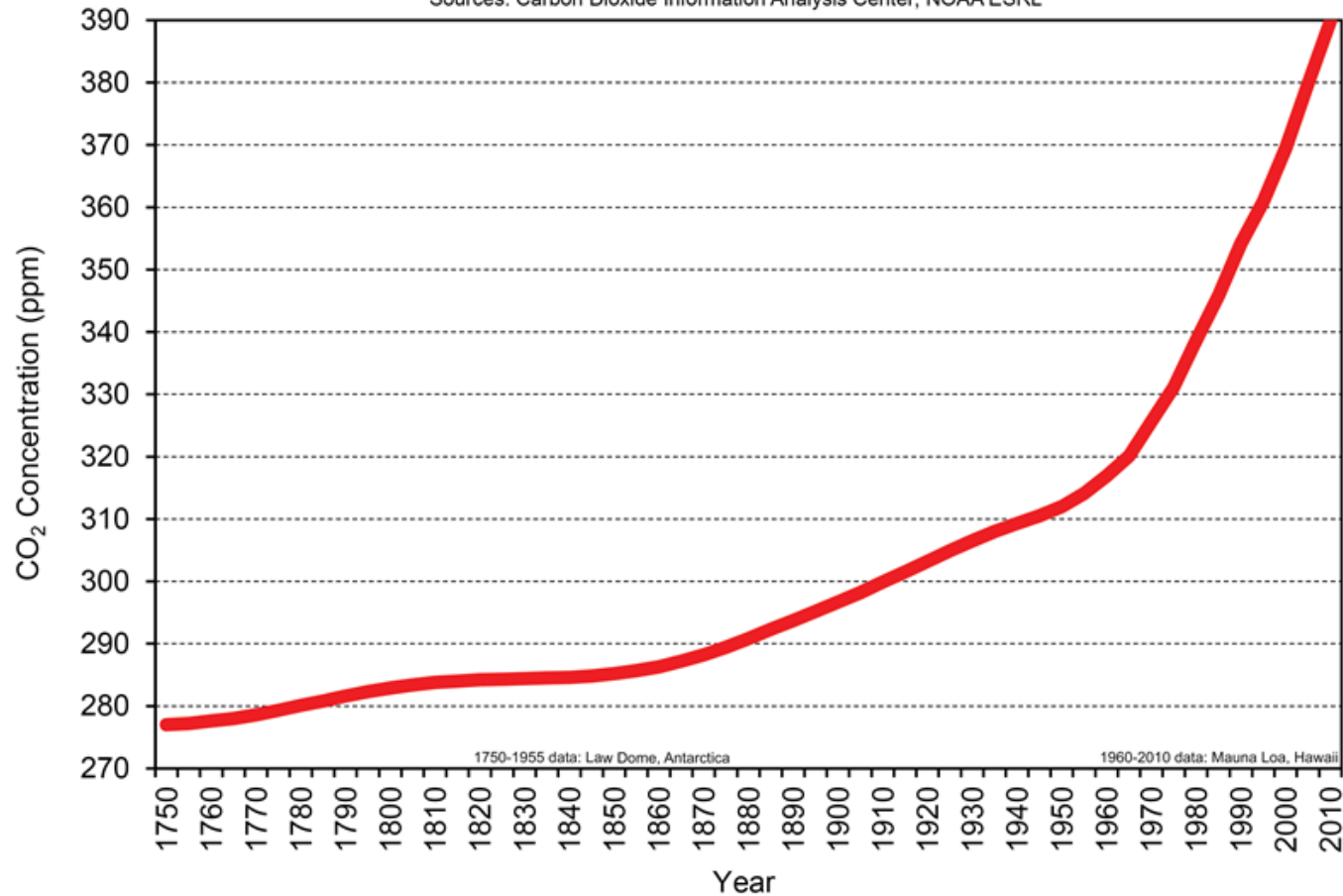
# Integrational sustainability dilemma

- Public debt accumulation
  - Japan debt 200% of GDP (Saijo, 2019)
- Resources allocation
  - 1,497 billion barrel of crude oil reserves (OPEC, 2019)
- Climate change

# Climate change

## Changes in Atmospheric CO<sub>2</sub> Concentrations

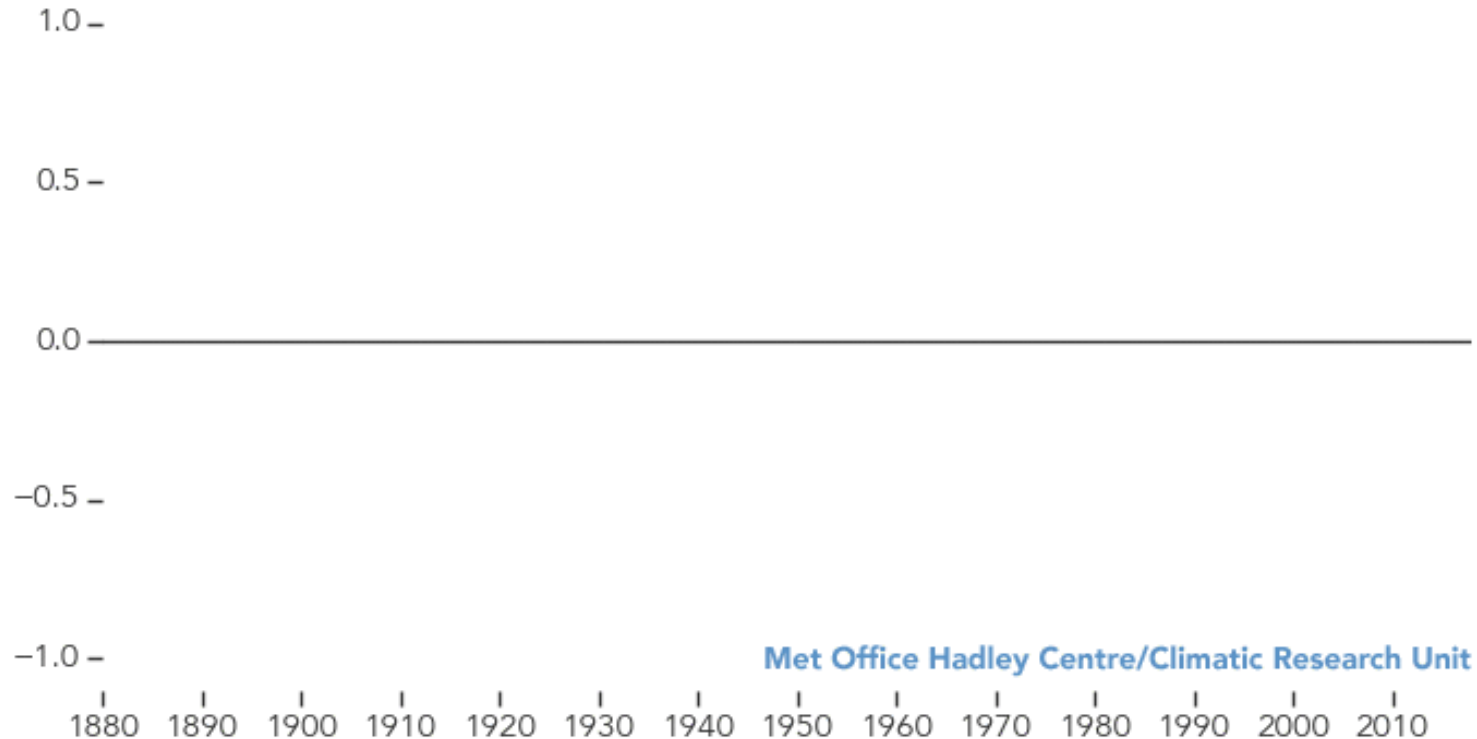
Sources: Carbon Dioxide Information Analysis Center; NOAA ESRL



# Climate change

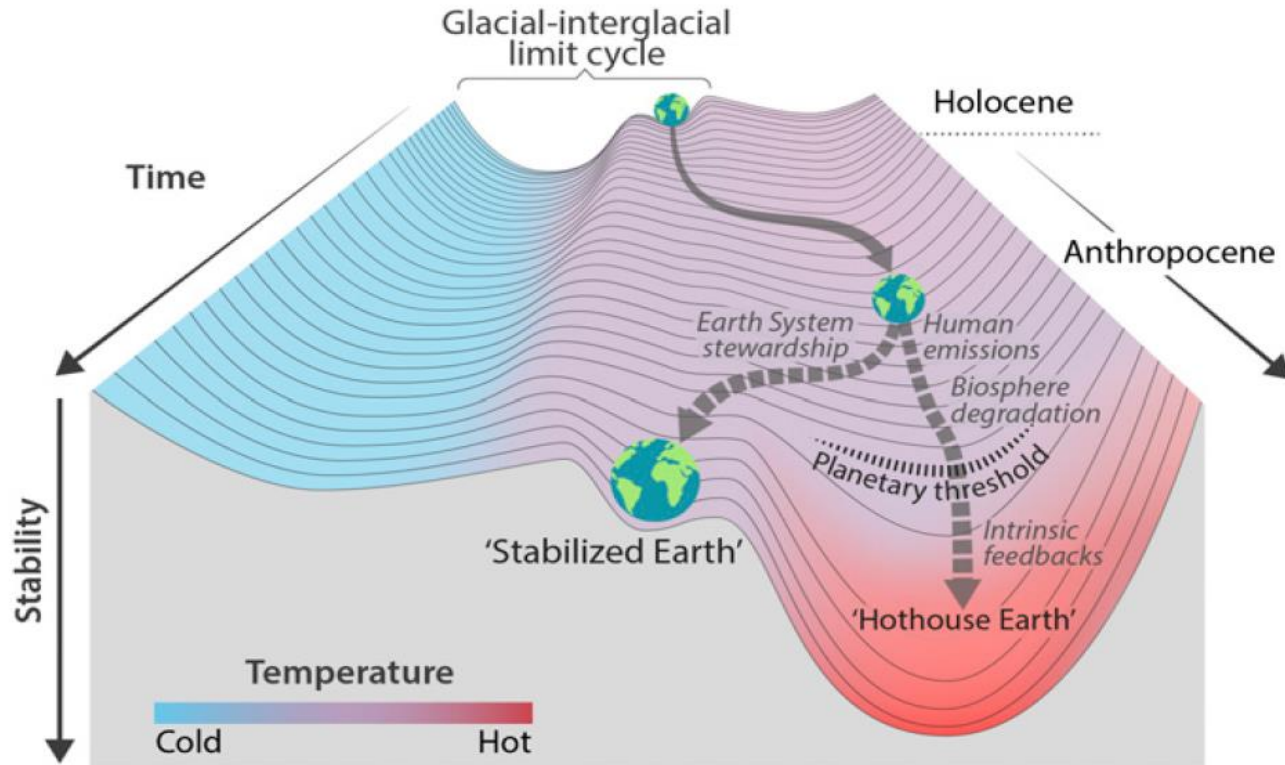
## A World of Agreement: Temperatures are Rising

Global Temperature Anomaly (°C)



Source: NASA Global climate Change, 2011

# Tipping point



Source: Trajectories of the Earth System in the Anthropocene, 2011

# Tipping point

- The time remain until CO<sub>2</sub> budget deplete is almost 10 years to reach the target of 1.5 °C (IPCC, 2018).
- The growing threat of abrupt and irreversible climate changes must be faced through economic action by individuals, companies, societies (Lenton, 2019).

# How an individual behaves in ISDG?

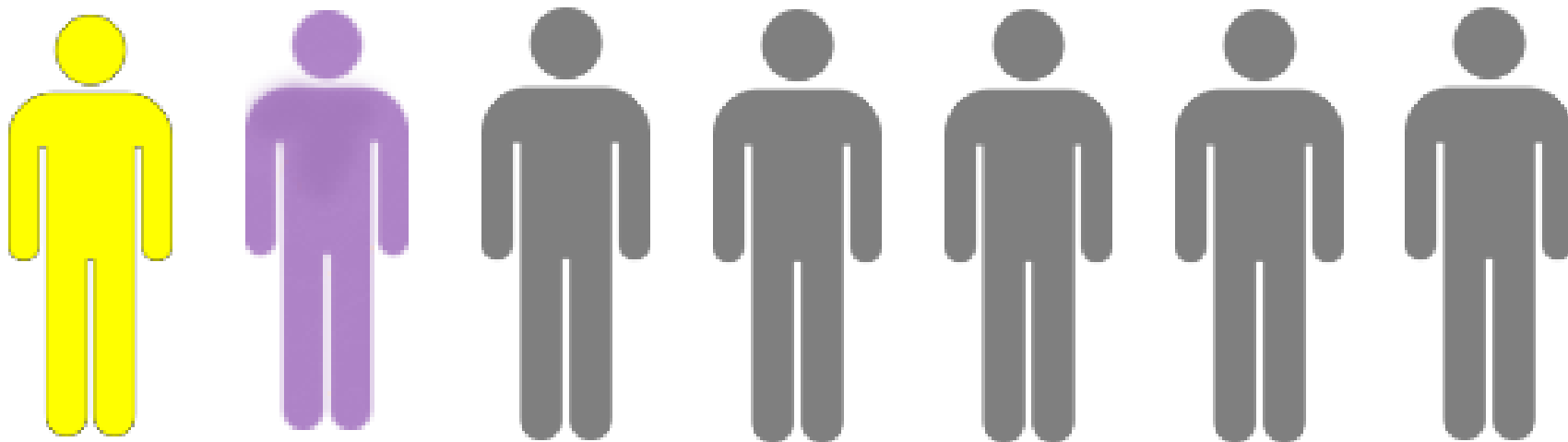
- Individual behavior regarding intergeneration suitability dilemma game.
- Information about the previous and future generational is fully provided.

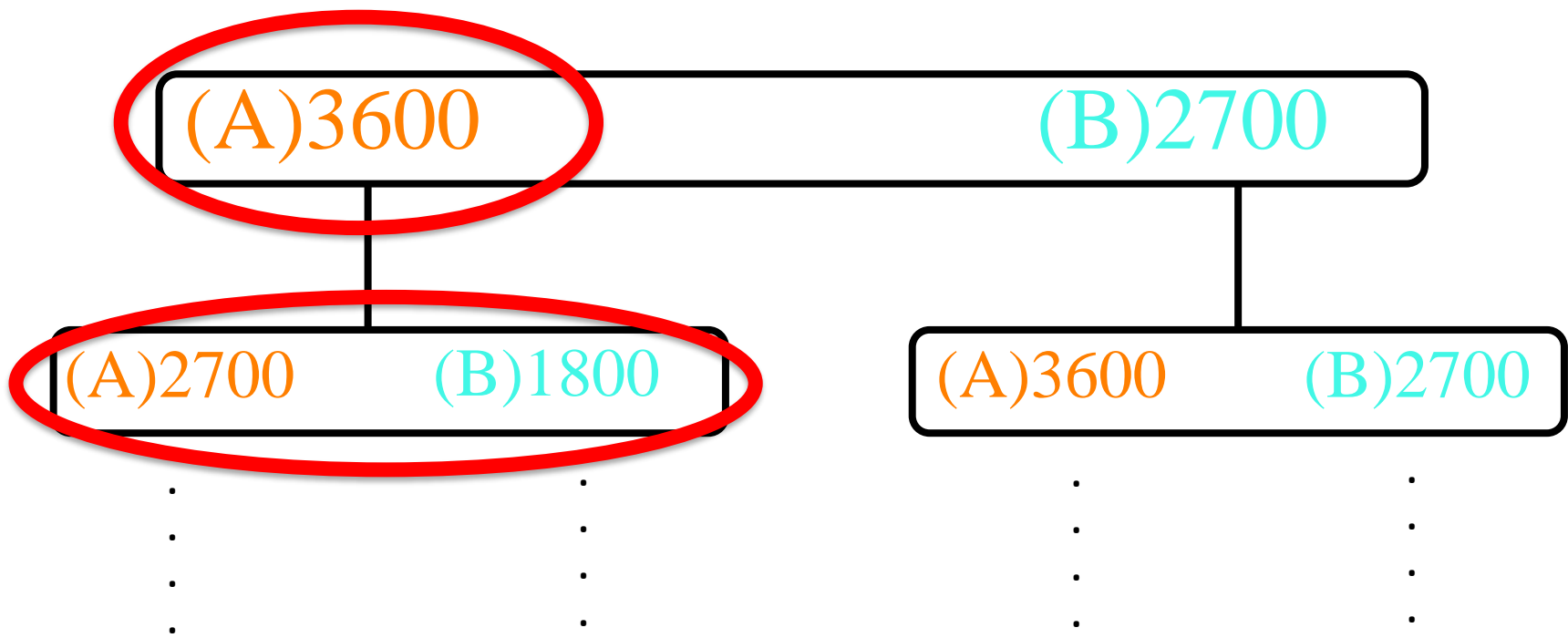


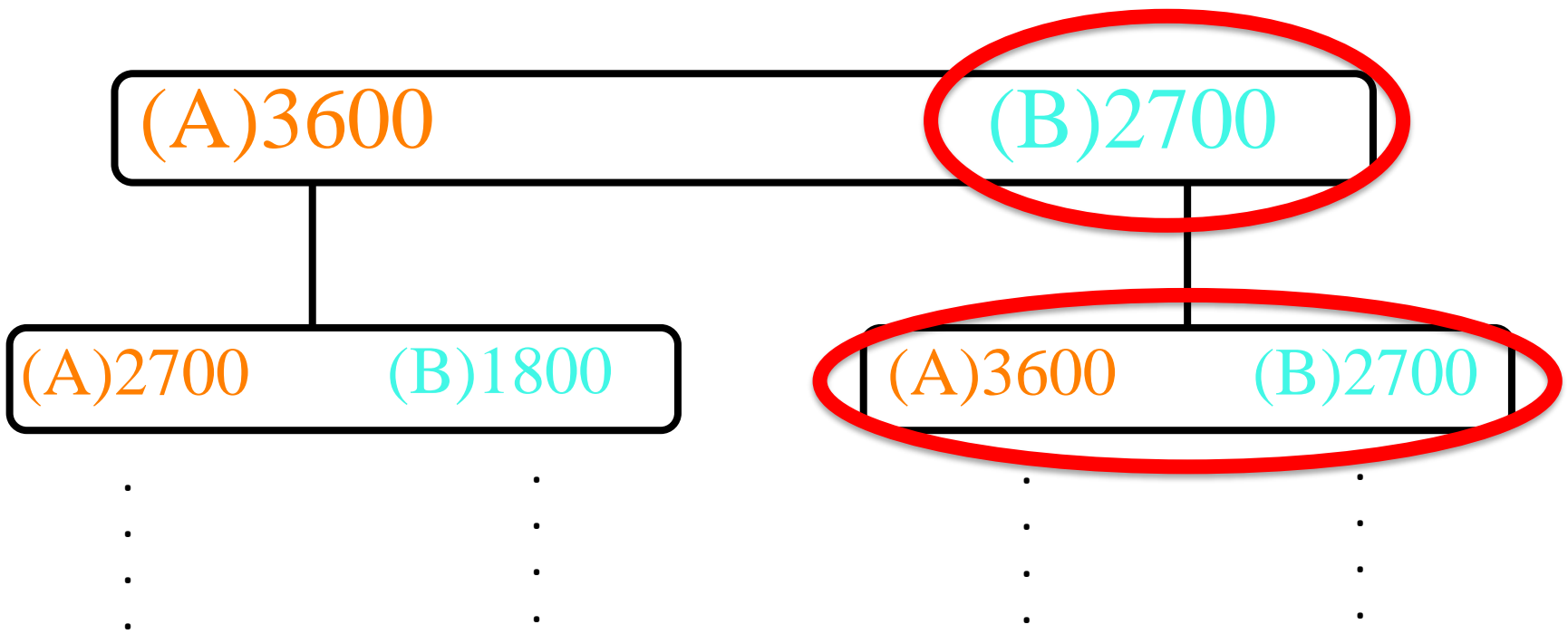
# How an individual behaves in ISDG?

- Can empathy influence the individual behavior towards future generations?
- Does information about previous and future generations alter the effect of empathy on the individual behavior?

# One Person: Intergenerational Sustainability Dilemma game (ISDG)









$D=900$



⋮

⋮

⋮

⋮



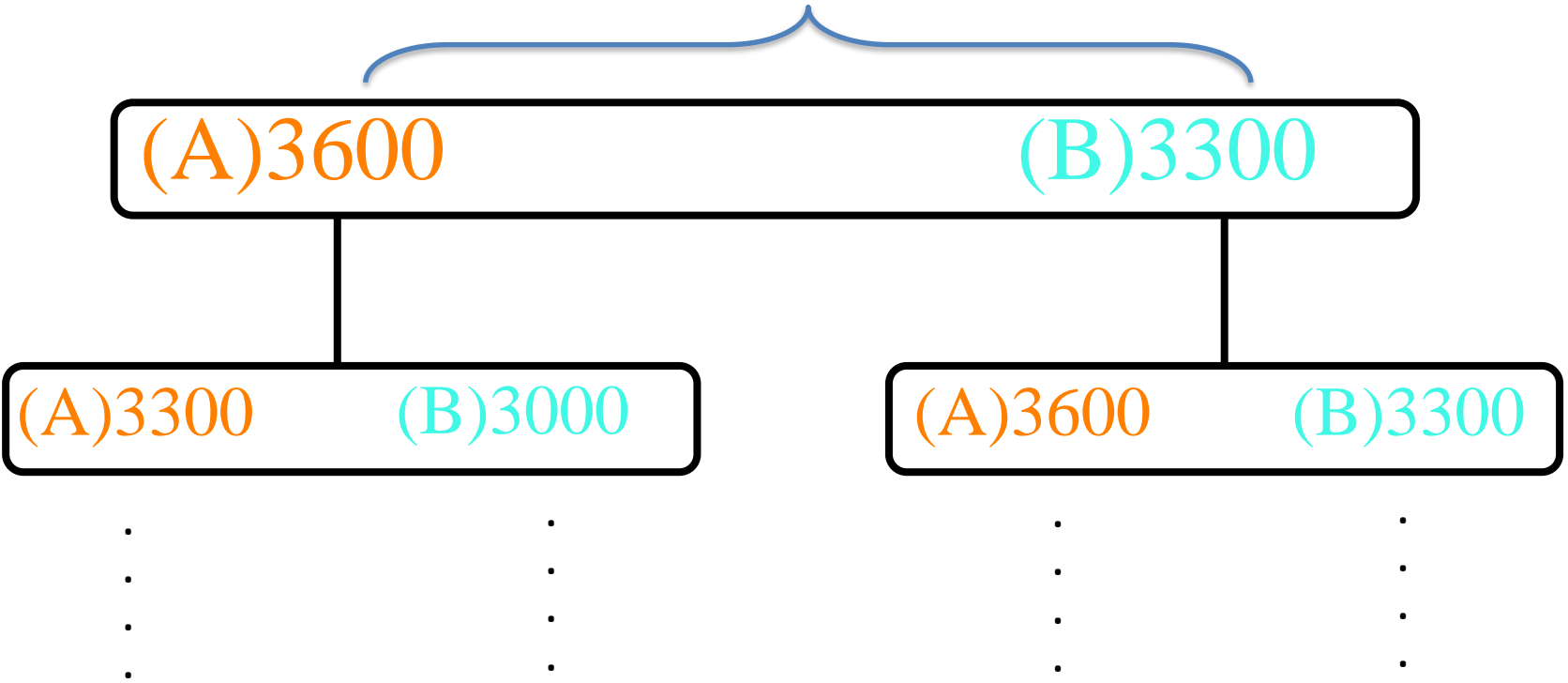
Option (A)=X=3600

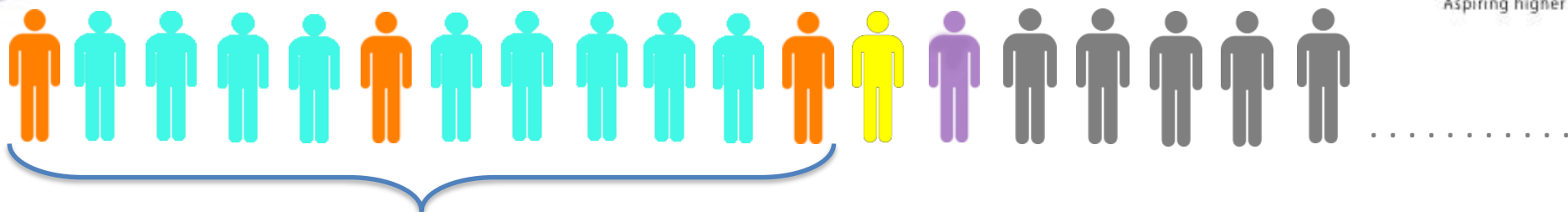


No. of future generations who could have the same resources= $X/D=6$  generations

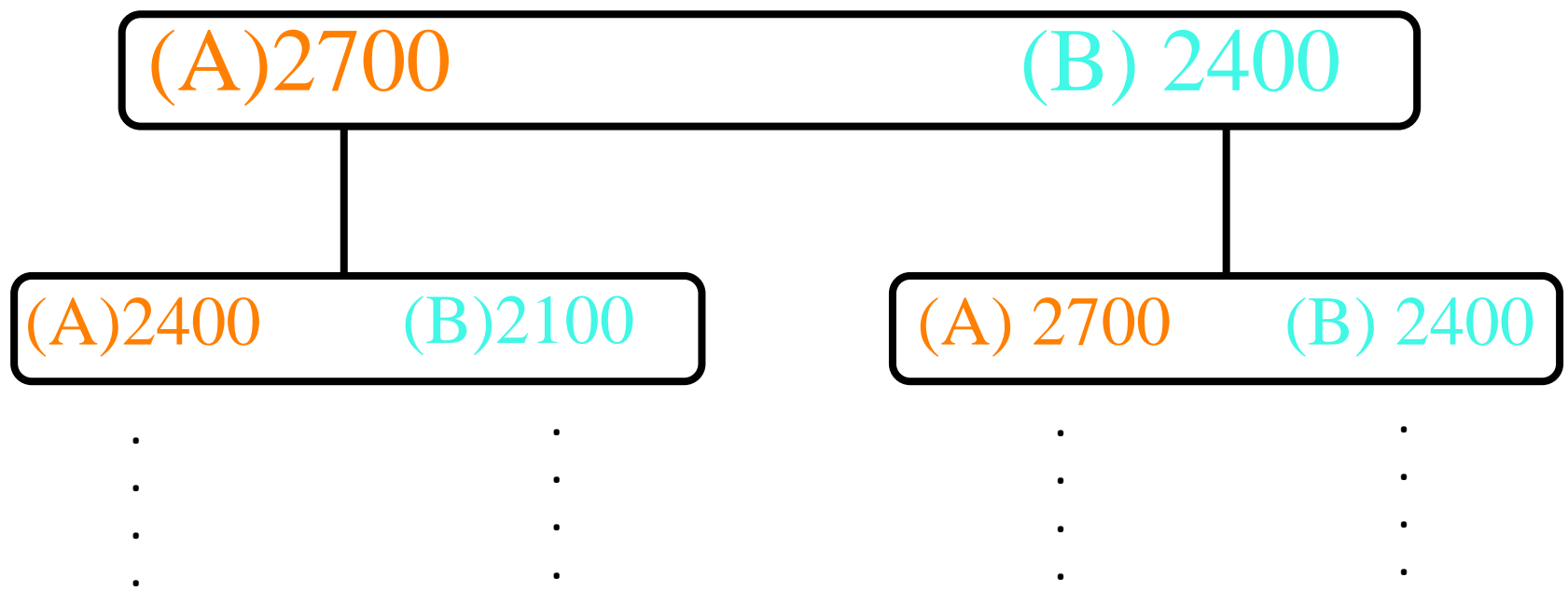


D=300





History of previous generations





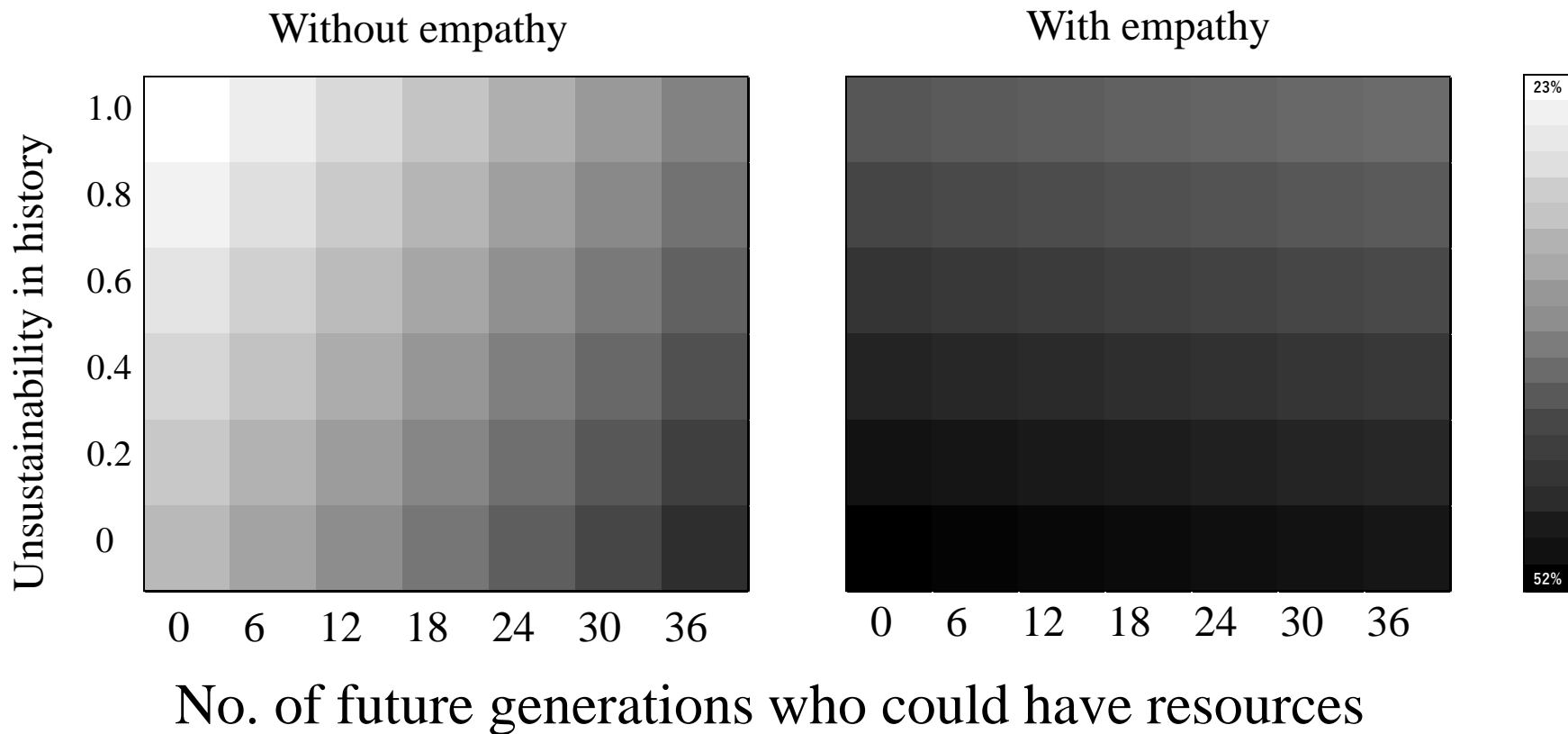
# The treatment

- We used future ahead and back (FAB) mechanism.
- Put current generation into future generation's shoes.
- We trigger the empathy through this mechanism.

# Results

Table 2: The number and percentage of choosing option *A* and *B* in basic ISDG and FAB treatment

	Option <i>A</i>	Option <i>B</i>	Total observations
Basic ISDG	1313 (66.3%)	667 (33.7%)	1980 (100%)
FAB	839 (55.5%)	673 (44.5%)	1512 (100%)



# Conclusion

- Empathy could be an effective mechanism that enable us to solve ISD.
- The information about the effect to the future generation could increase the empathy.
- As we are approaching the tipping point in the environmental system, it is time to implement this such a mechanism before it is too late.

# References

- Carbon Dioxide Information Analysis Center, (2019). retrieved from:  
<https://cdiac.ess-dive.lbl.gov/>
- IPCC, (2018) retrieved from:  
[https://www.ipcc.ch/site/assets/uploads/sites/2/2019/05/SR15\\_SPM\\_version\\_report\\_LR.pdf](https://www.ipcc.ch/site/assets/uploads/sites/2/2019/05/SR15_SPM_version_report_LR.pdf)
- Lenton T. M., Rockström J. , Gaffney O., Rahmstorf S., Richardson K., Steffen W., Schellnhuber, H. J. (2019). Nature, retrieved from:  
<https://www.nature.com/articles/d41586-019-03595-0>
- Mitchell, T. (2013). Carbon democracy. Verso
- OPEC Annual Statistical Bulletin, (2019), retrieved from:  
[https://www.opec.org/opec\\_web/en/data\\_graphs/330.htm?fbclid=IwAR0tU8TwmJCsJSJq0D4DzwTn2JzWznhwEabOuWKCMo9QQ3InvKMhX4aLXyo](https://www.opec.org/opec_web/en/data_graphs/330.htm?fbclid=IwAR0tU8TwmJCsJSJq0D4DzwTn2JzWznhwEabOuWKCMo9QQ3InvKMhX4aLXyo)
- Saijo, T. (2019) Future Design, Working paper SDES-2019-5, Research Institute for Future Design, Kochi University of Technology.

# References

- Shahrier, S., Kotani, K., Kakinaka, M. (2016). Social value orientation and capitalism in societies. PLoS ONE, e0165067.
- Steffen, W., Rockström, J., Richardson, K., Lenton, T. M., Folke, C., Liverman, D., Summerhayes, C. P., Barnosky, A. D., Cornell, S. E., Crucifix, M., Donges, J. F., Fetzer, I., Lade, S. J., Scheffer, M., Winkelmann, R., and Schellnhuber, H. J. (2018). Trajectories of the Earth system in the anthropocene. Proceedings of the National Academy of Sciences of the United States of America, 115:8252–8259.
- Voiland, A. (2011). Global temperature records in close agreement, NASA Global Climate Change. retrieved from:  
<https://climate.nasa.gov/news/468/global-temperature-records-in-close-agreement/>