

Outside the Safe Operating Space of the Planetary Boundary for Novel Entities

Supplemental Information

Linn Persson^{*a}, Bethanie M. Carney Almroth^b, Christopher D. Collins^c, Sarah Cornell^d, Cynthia A. de Wit^e, Miriam L. Diamond^f, Peter Fantke^g, Martin Hassellöv^h, Matthew MacLeod^e, Morten W. Ryberg^g, Peter Søgaard Jørgensen^{di}, Patricia Villarrubia-Gómez^d, Zhanyun Wangⁱ and Michael Zwicky Hauschild^g

^a Stockholm Environment Institute, Linnégatan 87D, Box 24218, 104 51 Stockholm, Sweden

^b Department of Biology and Environmental Sciences, University of Gothenburg, Box 465, 405 30 Gothenburg, Sweden

^c Department of Geography and Environmental Sciences, University of Reading, PO Box 217, Reading, Berkshire, RG6 6AH, United Kingdom

^d Stockholm Resilience Centre, Stockholm University, 106 91 Stockholm, Sweden

^e Department of Environmental Science, Stockholm University, 106 91 Stockholm, Sweden

^f Department of Earth Sciences; and School of the Environment, University of Toronto, Toronto, Canada M5S 3B1

^g Quantitative Sustainability Assessment, Department of Technology, Management and Economics, Technical University of Denmark, Produktionstorvet 424, 2800, Kgs. Lyngby, Denmark

^h Department of Marine Sciences, University of Gothenburg, Box 100, 405 30 Gothenburg, Sweden

ⁱ Global Economic Dynamics and the Biosphere, Royal Swedish Academy of Sciences, Lilla Frescativägen 4A, 104 05 Stockholm, Sweden

^j Institute of Environmental Engineering, ETH Zürich, 8093 Zürich, Switzerland

* Corresponding author: Linn Persson, linn.persson@ssnc.se, +46-707176630. Since August 2021 at the Swedish Society for Nature Conservation, SSNC, Box 4625, 116 91 Stockholm, and Affiliated Researcher at Stockholm Environment Institute.

Table of Contents

Figure S1. Global chemical industry production capacity, million tonnes per year. United Nations Environment Programme. <i>Global Chemicals Outlook II - From Legacies to Innovative Solutions</i> ; Nairobi, Kenya, 2019. p. 27.	3
Figure S2. Global production capacity of Ethylene, kg per capita, per year. United Nations Environment Programme. <i>Global Chemicals Outlook II - From Legacies to Innovative Solutions</i> ; Nairobi, Kenya, 2019. p. 45.	3
Figure S3. Global production capacity of propylene, kg per capita, per year. United Nations Environment Programme. <i>Global Chemicals Outlook II - From Legacies to Innovative Solutions</i> ; Nairobi, Kenya, 2019. p. 45.	4
Figure S4. Global production capacity of butadiene, kg per capita, per year. United Nations Environment Programme. <i>Global Chemicals Outlook II - From Legacies to Innovative Solutions</i> ; Nairobi, Kenya, 2019. p. 45.	4
Figure S5. Global production capacity of benzene, kg per capita, per year. United Nations Environment Programme. <i>Global Chemicals Outlook II - From Legacies to Innovative Solutions</i> ; Nairobi, Kenya, 2019. p. 45.	5
Figure S6. Global production capacity of toluene, kg per capita, per year. United Nations Environment Programme. <i>Global Chemicals Outlook II - From Legacies to Innovative Solutions</i> ; Nairobi, Kenya, 2019. p. 45.	5
Figure S7. Global production capacity of xylene, kg per capita, per year. United Nations Environment Programme. <i>Global Chemicals Outlook II - From Legacies to Innovative Solutions</i> ; Nairobi, Kenya, 2019. p. 45.	6
Figure S8. Global Production of pesticides, million kg of active ingredients per year. United Nations Environment Programme. <i>Global Chemicals Outlook II - From Legacies to Innovative Solutions</i> ; Nairobi, Kenya, 2019. p. 46.	6
Figure S9. Global plastics production, million tonnes per year. Geyer, R., Jambeck, J. R., & Law, K. L. (2017). Production, use, and fate of all plastics ever made. <i>Science Advances</i> , 3(7), e1700782. https://doi.org/10.1126/sciadv.1700782	7
Figure S10. Global antibiotics production, number of defined daily doses per year. Jørgensen, P. S., C. Folke, P. J. G. G. Henriksson, K. Malmros, M. Troell, A. Zorzet, and L. with R. Project. 2020. Coevolutionary Governance of Antibiotic and Pesticide Resistance. <i>Trends in Ecology and Evolution</i> 35(6):484–494.	7
References	8

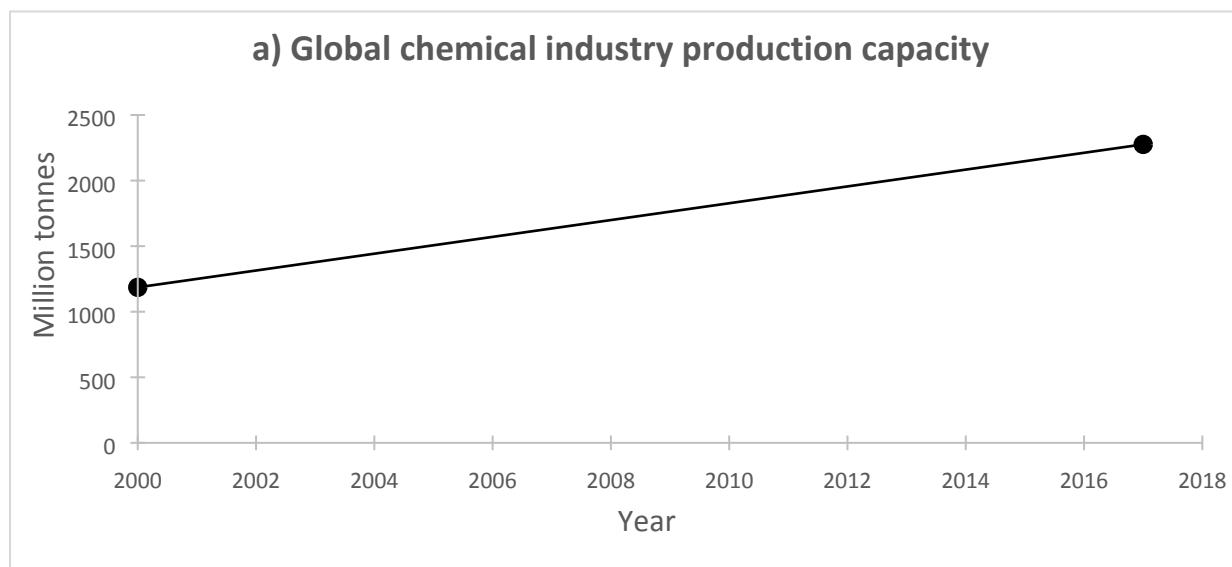


Figure S1. Global chemical industry production capacity, million tonnes per year. United Nations Environment Programme. *Global Chemicals Outlook II - From Legacies to Innovative Solutions*; Nairobi, Kenya, 2019. p. 27.

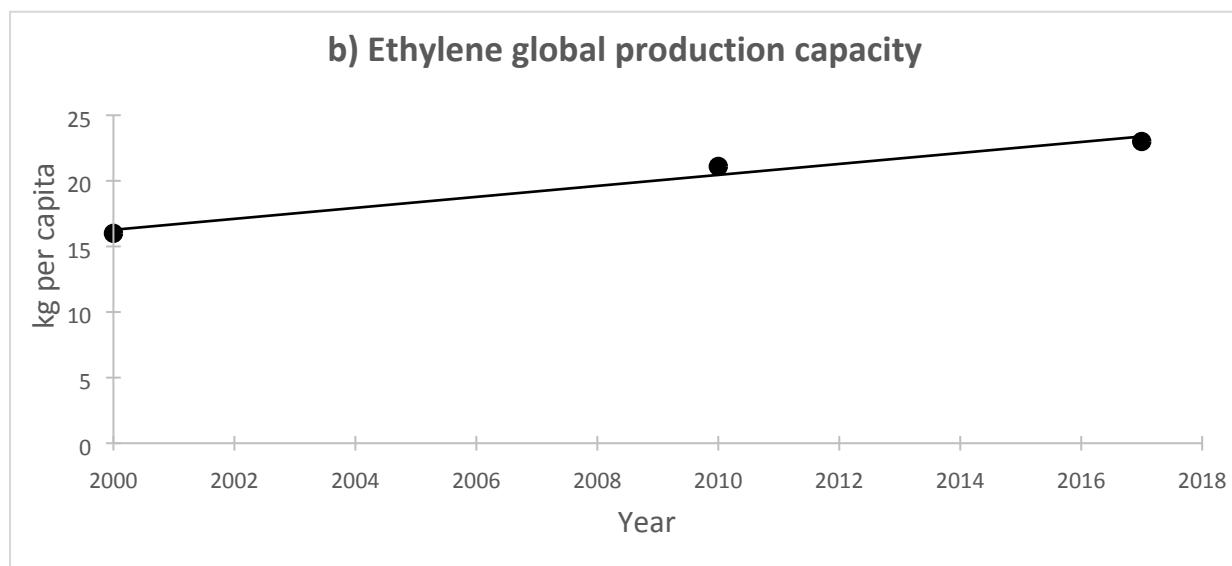


Figure S2. Global production capacity of Ethylene, kg per capita, per year. United Nations Environment Programme. *Global Chemicals Outlook II - From Legacies to Innovative Solutions*; Nairobi, Kenya, 2019. p. 45.

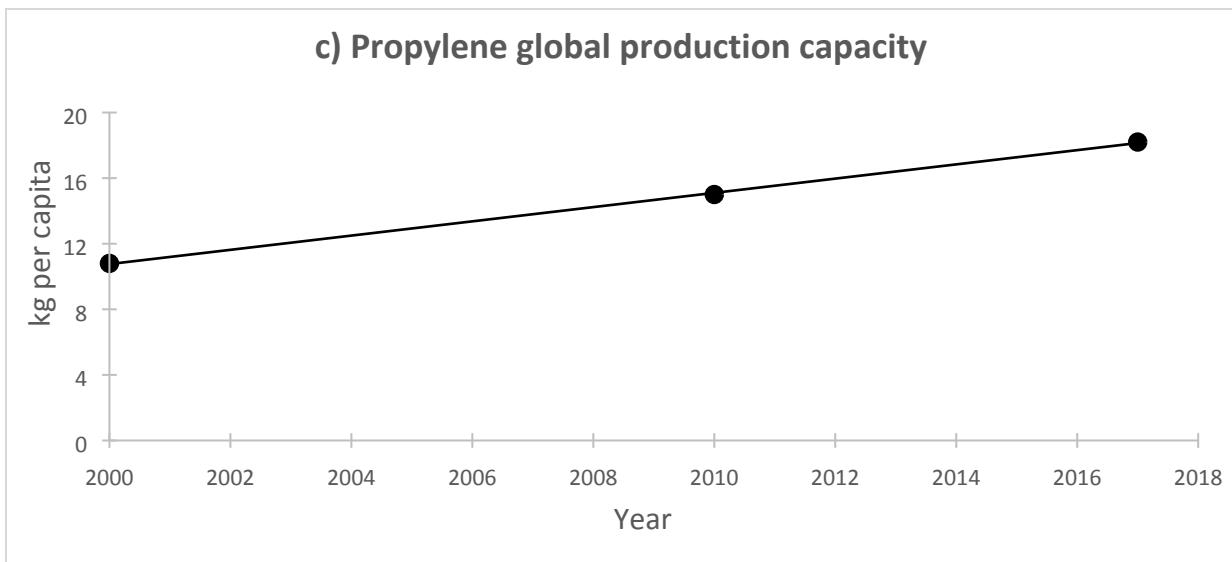


Figure S3. Global production capacity of propylene, kg per capita, per year. United Nations Environment Programme. *Global Chemicals Outlook II - From Legacies to Innovative Solutions*; Nairobi, Kenya, 2019. p. 45.

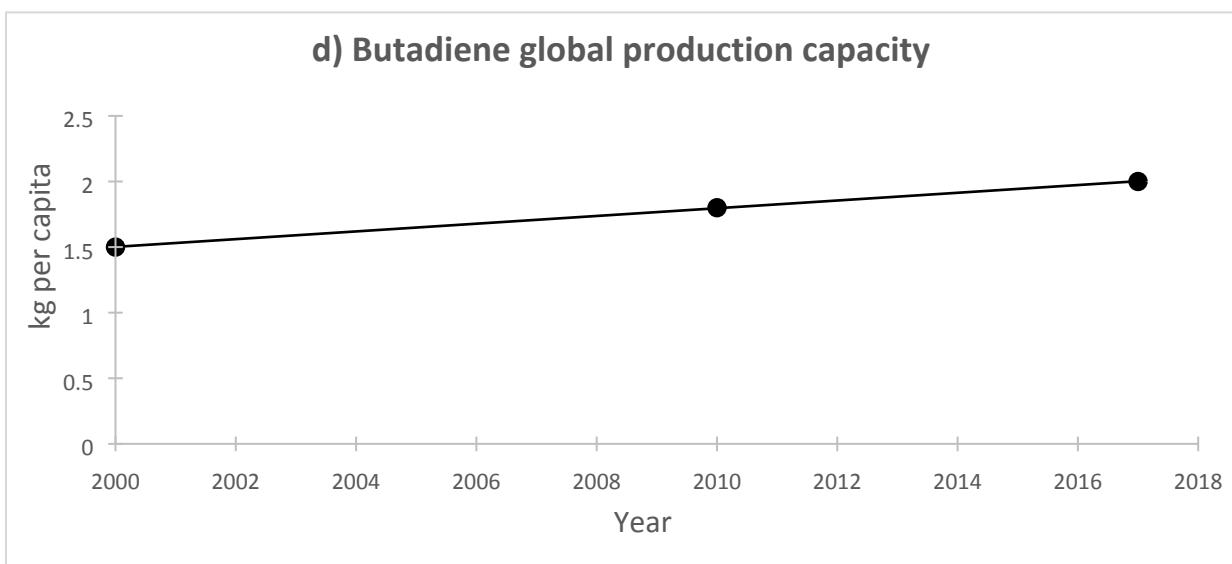


Figure S4. Global production capacity of butadiene, kg per capita, per year. United Nations Environment Programme. *Global Chemicals Outlook II - From Legacies to Innovative Solutions*; Nairobi, Kenya, 2019. p. 45.

e) Benzene global production capacity

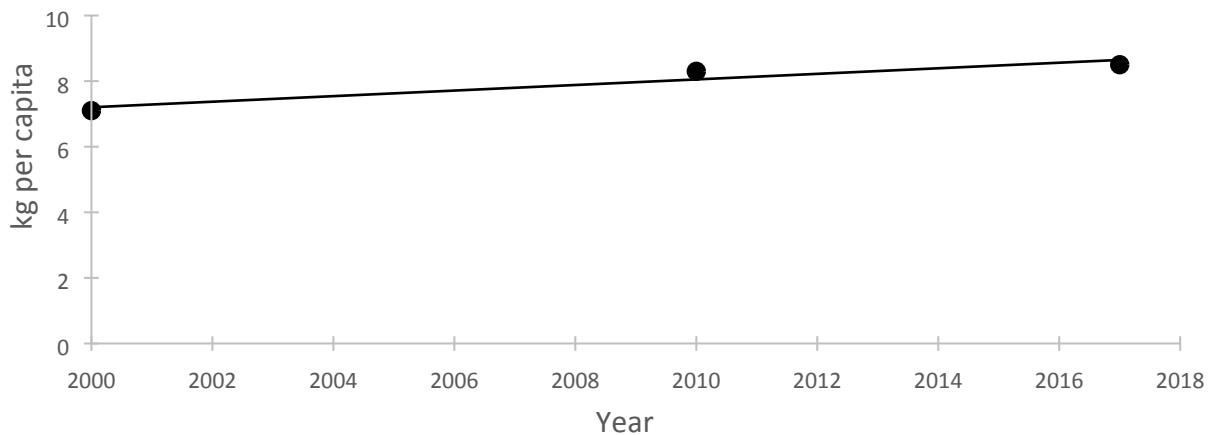


Figure S5. Global production capacity of benzene, kg per capita, per year. United Nations Environment Programme. *Global Chemicals Outlook II - From Legacies to Innovative Solutions*; Nairobi, Kenya, 2019. p. 45.

f) Toluene global production capacity

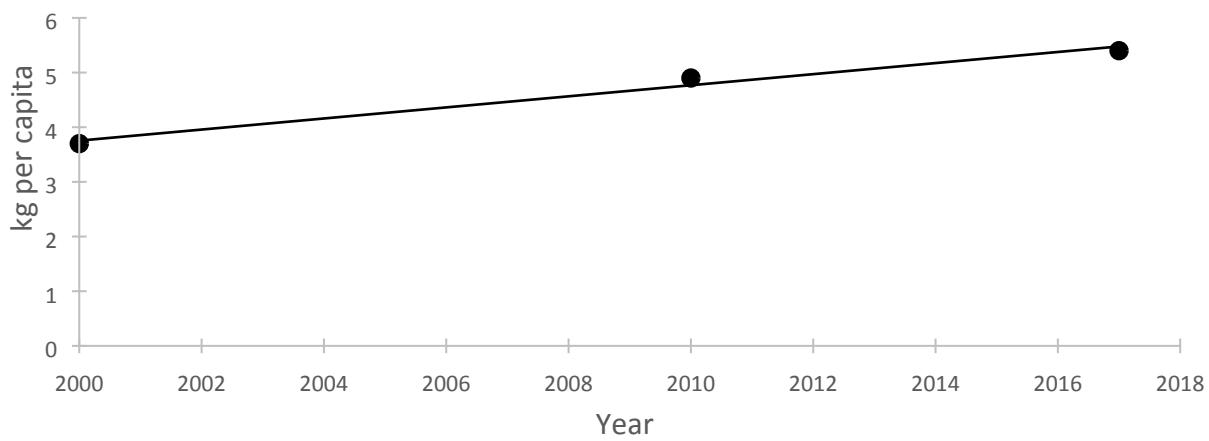


Figure S6. Global production capacity of toluene, kg per capita, per year. United Nations Environment Programme. *Global Chemicals Outlook II - From Legacies to Innovative Solutions*; Nairobi, Kenya, 2019. p. 45.

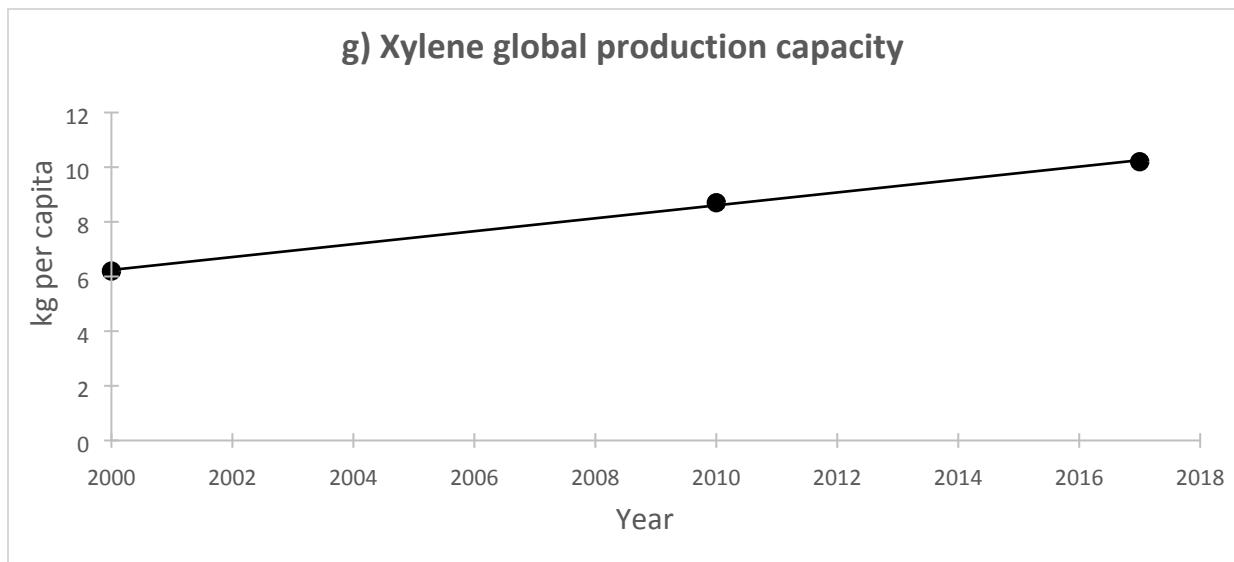


Figure S7. Global production capacity of xylene, kg per capita, per year. United Nations Environment Programme. *Global Chemicals Outlook II - From Legacies to Innovative Solutions*; Nairobi, Kenya, 2019. p. 45.

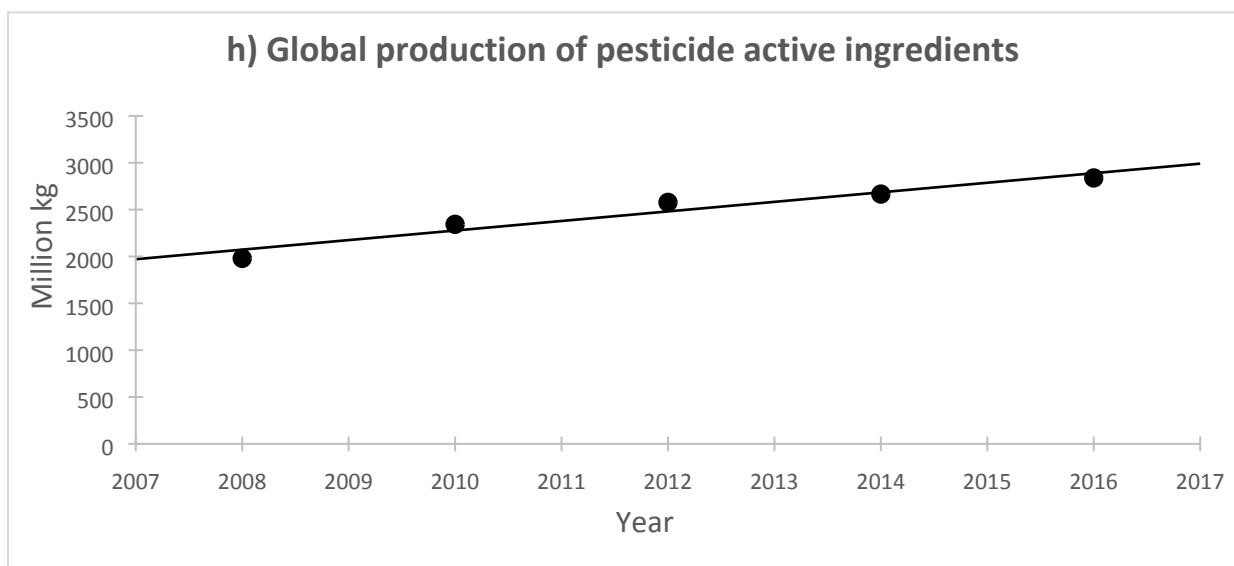


Figure S8. Global Production of pesticides, million kg of active ingredients per year. United Nations Environment Programme. *Global Chemicals Outlook II - From Legacies to Innovative Solutions*; Nairobi, Kenya, 2019. p. 46.

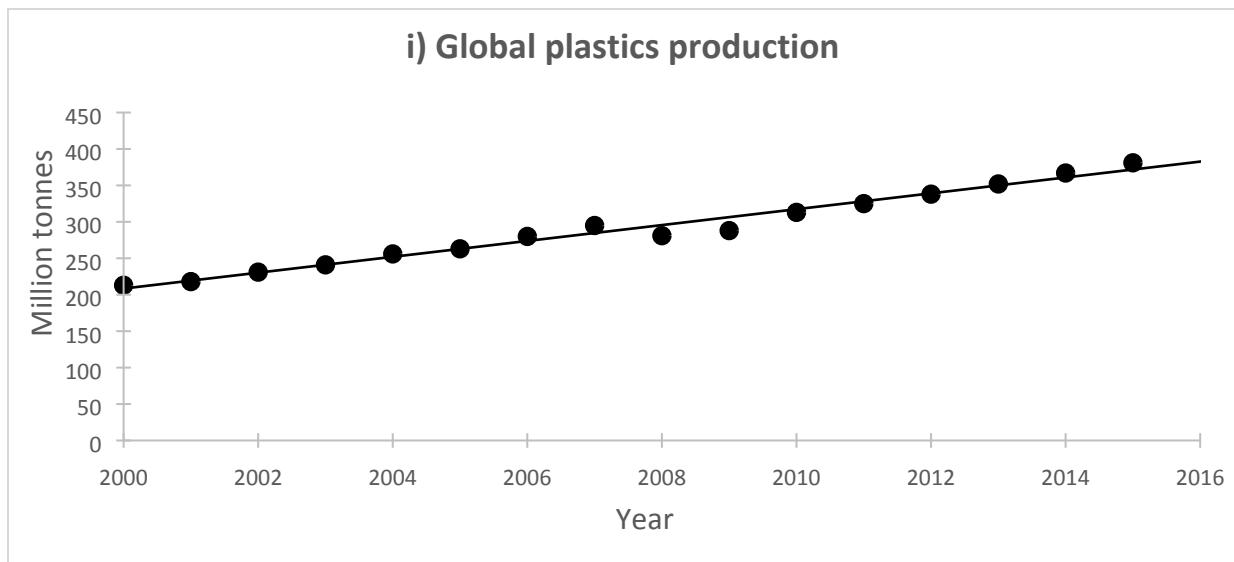


Figure S9. Global plastics production, million tonnes per year. Geyer, R., Jambeck, J. R., & Law, K. L. (2017). Production, use, and fate of all plastics ever made. *Science Advances*, 3(7), e1700782. <https://doi.org/10.1126/sciadv.1700782>

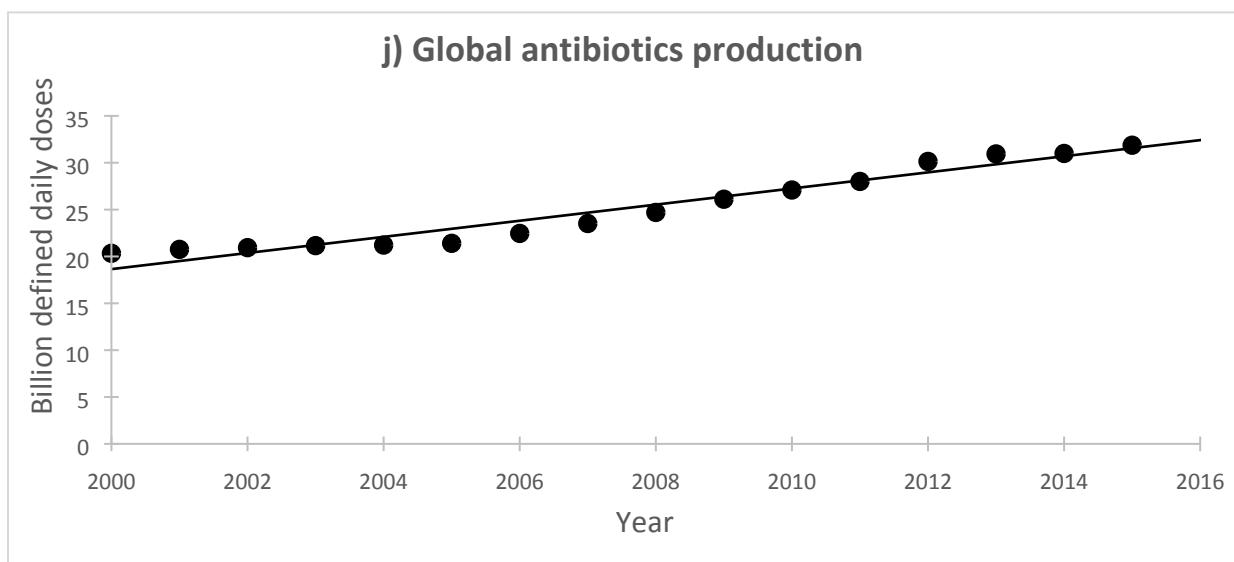


Figure S10. Global antibiotics production, number of defined daily doses per year. Jørgensen, P. S., C. Folke, P. J. G. G. Henriksson, K. Malmros, M. Troell, A. Zorzet, and L. with R. Project. 2020. Coevolutionary Governance of Antibiotic and Pesticide Resistance. *Trends in Ecology and Evolution* 35(6):484–494.

References

Geyer, R., Jambeck, J. R., & Law, K. L. (2017). Production, use, and fate of all plastics ever made. *Science Advances*, 3(7), e1700782. <https://doi.org/10.1126/sciadv.1700782>

Global Chemicals Outlook II - From Legacies to Innovative Solutions; Nairobi, Kenya, 2019. United Nations Environment Programme.

Jørgensen, P. S., C. Folke, P. J. G. G. Henriksson, K. Malmros, M. Troell, A. Zorzet, and L. with R. Project. 2020. Coevolutionary Governance of Antibiotic and Pesticide Resistance. *Trends in Ecology and Evolution* 35(6):484–494.