

Master's in Public Health

Course syllabus: Planetary Health
2022/2023

Department of Experimental and Health Sciences
UNIVERSITAT POMPEU FABRA - UNIVERSITAT AUTÒNOMA
DE BARCELONA - ISGlobal (Barcelona Institute for Global Health)

Act. 21/12/22



DESCRIPTION

Academic course: 2022-2023

Subject name: Planetary Health

Kind of subject: Optional

Credits: 3 ECTS (75 hours)

Professors: Cristina O'Callaghan, Josep Maria Antó, Cathryn Tonne, Oriana Ramírez

Coordination: Cristina O'Callaghan

Language: English

PROFESSORS

Cristina O'Callaghan Gordo

Associated researcher – Barcelona Institute for Global Health (ISGlobal)

Associate Professor Universitat Oberta de Catalunya (UOC), Faculty of Health Sciences

Telf. 932147321 - E-mail: cristina.ocallaghan@isglobal.org

Josep M. Antó

Research Professor-Barcelona Institute for Global Health (ISGlobal)

Professor of Medicine – Department of Experimental and Health Sciences-Universitat Pompeu Fabra

Telf: 932147360 - E-mail: josepm.anto@isglobal.org

PRESENTATION

Planetary health is the achievement of the highest attainable standard of health, wellbeing, and equity worldwide through judicious attention to the human systems—political, economic, and social— within the limits of Earth’s natural systems. The concept of Planetary Health arises in the context of the global environmental and climate crisis that defines the Anthropocene. The general objective of this course is to understand the changes that the Anthropocene entails in natural systems and to analyze the main challenges that these changes pose for health. The main governance strategies for the development and implementation of responses to achieve Planetary Health will also be introduced.

LEARNING OUTCOMES

At the end of this course the students are expected to be able to:

- Describe the main changes in the Earth’s natural systems that characterize the Anthropocene, as well as explain the complex dynamics and interactions of these changes.
- Explain health problems in terms of Planetary Health, identifying the impacts of the environment on health and the impacts of human activity, including health, on the planet.
- Identify and explain the main determinants of anthropogenic change in natural systems.
- Identify and categorize the main impacts of global environmental change on human health.
- Recognize, analyze, and argue the main strategies to promote Planetary Health.
- Critically assess the governance strategies necessary to promote a sustainable society, such as the 2030 Agenda.

COMPETENCES TO ACHIEVE

GENERAL SKILLS

- Search for, analyse, assess and use information provided to make decisions in complex situations.
- Work in interdisciplinary teams to attain shared goals in relation to planetary health.
- Write and speak in a correct, clear way that is suitable in academic and/or professional contexts for effective communication of planetary health challenges to the academic sector, civil society, politicians and interested parties.
- Resolve complex situations in a feasible, sustainable way, by analysing their components, finding alternatives, reaching consensus on their application, and assessing the results of their implementation.

SPECIFIC SKILLS

- Analyze health problems from the understanding that these and their social determinants depend on the quality and stability of the Earth’s natural systems.
- Analyze, synthesize, and interpret data from global quantitative models from different scientific disciplines related to Planetary Health.
- Determine the complexity of the challenges posed by Planetary Health and evaluate the interactions between natural systems, socioeconomic factors, and the political and cultural context that determine these challenges.
- Apply critical and creative thinking to propose improvements or solutions in areas and situations of diverse complexity in relation to Planetary Health.

METHODOLOGY

3 ECTS credits, 75 hours of dedication distributed in 22 contact hours, distributed in 11 sessions devoted to lectures, case studies and seminars, and 53 hours of personal work:

Activity	Description of the activity	Contact hours
Lectures	Master classes. They may include in-class exercises and classroom discussion.	9 hours 30 minutes
Case studies	Discussion of scientific papers, reports, or real case studies. Students will have to critically read the case study before the session (<u>individual work before the session</u>). During the session, they will analyze and discuss in small groups the case study following a guide provided and present their work to the rest of the students. The session will be complemented by classroom discussion and concluding remarks by the teacher.	9 hours 30 minutes
Seminars, conferences	Visualization of pre-recorded conferences, seminars or talks, followed by a classroom discussion.	3 hours
Personal work (including writing a short essay)	Personal work includes preparation of cases studies, reading of suggested bibliography, writing a short essay and prepare a poster on a relevant topic of Planetary Health and exam preparation.	53 hours: 10 preparation of case studies, 23 writing short essay, 20 exam preparation

EVALUATION

Contribution to the final grade
Exam, short answer questions 40%
Participation in the case studies and classroom discussions 15%
Final essay and poster 45%

CALENDAR

Date	Time	Content of the session
13/01/22	15:00-19:30	<p>15:00-15:30. Presentation of the course – <i>Josep M. Antó & Cristina O’Callaghan</i></p> <p>15:30-16:15. Lecture 1: Introduction to Planetary Health – <i>Josep M. Antó</i></p> <p>16:15-16:30. Break</p> <p>16:30-17:45. Lecture 2: Current changes in the Earth’s natural systems – <i>Cristina O’Callaghan</i></p> <p>17:45-18:00. Break</p> <p>18:00-19:30. Seminar Planetary Boundaries – <i>Josep M. Antó & Cristina O’Callaghan</i></p>
20/01/22	15:00-19:30	<p>15:00-16:00. Introduction to writing an essay and poster on planetary health – <i>Josep M. Antó & Cristina O’Callaghan</i></p> <p>16:00-17:00. Lecture 3: Main risks of environmental change for human health – <i>Josep M. Antó</i></p> <p>17:00-17:30. Break</p> <p>17:30-19:30. Case study 1: The paradox of improved health and natural systems deterioration – <i>Cristina O’Callaghan</i></p>
27/01/22	15:00-19:30	<p>15:00-16:00. Lecture 4: Climate change and health – <i>Cathryn Tonne</i></p> <p>16:00-17:30. Case study 2: Climate change and urban environment – <i>Cathryn Tonne</i></p> <p>17:30-18:00. Break</p> <p>18:00-19:30. Lecture 5: Challenges for Planetary Health – <i>Cristina O’Callaghan</i></p>
03/02/22	15:00-19:30	<p>15:00-16:00. Lecture 6: Governance for a sustainable society health – <i>Josep M. Antó</i></p> <p>16:00-17:30. Seminar COVID-19, a disease of the Anthropocene – <i>Josep M. Antó & Cristina O’Callaghan</i></p> <p>17:30-18:00. Break</p> <p>18:00-19:30. Case study 3: Environmental impacts of health systems – <i>Josep M. Antó</i></p>
10/02/22	15:00-19:30	<p>15:00-17:00. Case study 4: Sustainable development goals – a case study on the Epidemic of Chronic Kidney Disease of unknown causes in Central America – <i>Oriana Ramírez</i></p> <p>17:00-17:30. Break</p> <p>17:30-19:00. Case study 5: Food systems: a planetary health approach – <i>Cristina O’Callaghan</i></p> <p>19:00-19:30. Co-creation activity – <i>Ariadna Moreno & Cristina O’Callaghan</i></p>
17/02/22	15:00-17:00	<p>15:00-17:00. Poster presentation – <i>Josep M. Antó & Cristina O’Callaghan</i></p>

OUTLINE SESSIONS AND READINGS

SESSION 1 – 13th January

<i>Lecture 1: Introduction to Planetary Health</i>		Aula Global
Josep M. Antó		
Outline	<ul style="list-style-type: none"> • Global health trends and their determinants • The paradox of improving health and deteriorating the environment • Anthropocene and Planetary Health 	
Recommended readings	Crutzen PJ. 2002. Geology of mankind . Nature 415:23–23; doi:10.1038/415023a.	Yes
	Myers SS. Planetary health: protecting human health on a rapidly changing planet . Lancet 2018; 390: 2860-2868	Yes
	Whitmee S, Haines A, Beyrer C, Boltz F, Capon AG, De Souza Dias BF, et al. 2015. Safeguarding human health in the Anthropocene epoch: Report of the Rockefeller Foundation-Lancet Commission on planetary health . Lancet 386:1973–2028; doi:10.1016/S0140-6736(15)60901-1.	Yes

<i>Lecture 2: Current changes in the Earth’s natural systems</i>		Aula Global
Cristina O’Callaghan		
Outline	<ul style="list-style-type: none"> • Limits of the Earth for a sustainable society • Changes in major natural systems: climate, oceans, fresh waters, land use and soil erosion, phosphorus and nitrogen cycles, global chemical pollution, loss of biodiversity • Dynamics and complex interactions in natural systems. Tipping points (points of no return) 	
Recommended reading	Rockström J, Steffen W, Noone K, Persson Å, Chapin FSI, Lambin E, et al. 2009. Planetary Boundaries: Exploring the Safe Operating Space for Humanity . Ecol Soc 14: art32; doi:10.5751/ES-03180-140232.	Yes
	Steffen W, Richardson K, Rockström J, Cornell SE, Fetzer I, Bennett EM, et al. 2015. Planetary boundaries: Guiding human development on a changing planet . Science 2015; 347 (a summary) and Science 2015; 347: 1259855; doi:10.1126/science.1259855 (main research article)	Yes
	UN Environement, ed. 2019. Global Environment Outlook – GEO-6: Summary for Policymakers . Cambridge University Press.	Yes

<i>Seminar 1 - Planetary Boundaries</i>		Aula Global
Josep M. Antó & Cristina O'Callaghan		
Outline	<ul style="list-style-type: none"> • Introduction to the concept and framework of planetary boundaries • Update on recent developments including the boundary of novel entities (pollution) • Viewing and discussion of the Netflix documentary “Breaking boundaries”. 	
Recommended reading	<p>Steffen W, Richardson K, Rockström J, Cornell SE, Fetzer I, Bennett EM, et al. 2015. Planetary boundaries: Guiding human development on a changing planet. Science 2015; 347 (a summary) and Science 2015; 347: 1259855; doi:10.1126/science.1259855 (main research article)</p> <p>View the documentary: Breaking Boundaries: The Science of Our Planet</p>	<p>Yes</p> <p>Yes</p>

SESSION 2 – 20th January

<p><i>Introduction to writing an essay and poster on Planetary Health</i></p> <p>Josep M. Antó and Cristina O’Callaghan</p>		<p>Aula Global</p>
<p>Outline</p>	<p>Students are expected to write a short essay (2000 words, references not included) including a poster to present the main essay conclusions on a topic relevant to Planetary Health.</p> <p>Essays and its corresponding posters should include an analysis of a Planetary Health challenge including potential sustainable solutions to it.</p> <p>A list of suggested topics will be provided.</p>	

<p><i>Lecture 3: Main risks of environmental change for human health</i></p> <p>Josep M. Antó</p>		<p>Aula Global</p>
<p>Outline</p>	<ul style="list-style-type: none"> • Mapping the environmental determinants of human health • A planetary health approach to environmental health risks • Food security and nutrition • Influence of global change in infectious diseases transmitted by water, zoonosis, and vectors • Atmospheric and chemical pollution • Extreme weather events 	
<p>Recommended reading</p>	<p>Eisenberg JNS, Desai M A, Levy K, Bates SJ, Liang S, Naumoff K, et al. 2007. Environmental determinants of infectious disease: a framework for tracking causal links and guiding public health research. Environ Heal Perspectives 115: 1216–23</p> <p>Landrigan PJ, Fuller R, Acosta NJR, Adeyi O, Arnold R, Basu N (Nil), et al. 2018. The Lancet Commission on pollution and health. Lancet 391:462–512; doi:10.1016/S0140-6736(17)32345-0.</p> <p>Whitmee S, Haines A, Beyrer C, Boltz F, Capon AG, De Souza Dias BF, et al. 2015. Safeguarding human health in the Anthropocene epoch: Report of the Rockefeller Foundation-Lancet Commission on planetary health. Lancet 386:1973–2028; doi:10.1016/S0140-6736(15)60901-1.</p> <p>Willett W, Rockström J, Loken B, Springmann M, Lang T, Vermeulen S, et al. 2019. Food in the Anthropocene: the EAT–Lancet Commission on healthy diets from sustainable food systems. Lancet 393:447–492; doi:10.1016/S0140-6736(18)31788-4.</p>	<p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p>

<p><i>Case study 1: The paradox of improved health and natural systems deterioration</i></p> <p>Cristina O’Callaghan</p>		<p>Aula Global</p>
<p>Outline</p>	<ul style="list-style-type: none"> • <u>Before the session</u>: Reading the following article: “Safeguarding human health in the Anthropocene epoch: Report of the Rockefeller Foundation-Lancet Commission on planetary health. Pages 1974-1979” • <u>During session</u>: <ul style="list-style-type: none"> ○ Exercise in small groups and presentation of results ○ Classroom discussion ○ Summary provided by professor 	
<p>Mandatory reading (case study)</p>	<p>Whitmee S, Haines A, Beyrer C, Boltz F, Capon AG, De Souza Dias BF, et al. 2015. Safeguarding human health in the Anthropocene epoch: Report of the Rockefeller Foundation-Lancet Commission on planetary health. Lancet 386:1973–2028; doi:10.1016/S0140-6736(15)60901-1. <u>Pages 1974-1979</u></p>	<p>Yes</p>
<p>Recommended reading</p>	<p>Raudsepp-Hearne, C., Peterson, G. D., Tengö, M., Bennett, E. M., Holland, T., Benessaiah, K., MacDonald, G. K., & Pfeifer, L. (2010). Untangling the Environmentalist’s Paradox: Why Is Human Well-being Increasing as Ecosystem Services Degrade? BioScience, 60(8), 576-589. https://doi.org/10.1525/bio.2010.60.8.4</p> <p>World Health Organization – Climate change and human health</p>	<p>Yes</p>

SESSION 3 – 27th January

<i>Lecture 4: Climate change and health</i>		Aula Global
Cathryn Tonne		
Outline	<ul style="list-style-type: none"> • Identification and characterization of climate change • Health effects of climate change: direct and indirect effects • Solutions for mitigation and adaptation to climate change from Planetary Health and challenges for their implementation 	
Recommended reading	<p>IPCC, 2018: Summary for Policymakers. In: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)]. World Meteorological Organization, Geneva, Switzerland, 32 pp.</p> <p>Watts N, Amann M, Arnell N, Ayeb-Karlsson S, Belesova K, Boykoff M, et al. 2019. The 2019 report of The Lancet Countdown on health and climate change: ensuring that the health of a child born today is not defined by a changing climate. Lancet 394:1836–1878; doi:10.1016/S0140-6736(19)32596-6.</p> <p>Watts N, Amann M, Ayeb-Karlsson S, Belesova K, Bouley T, Boykoff M, et al. 2018. The Lancet Countdown on health and climate change: from 25 years of inaction to a global transformation for public health. Lancet 391:581–630; doi:10.1016/S0140-6736(17)32464-9.</p>	<p>Yes</p> <p>Yes</p> <p>Yes</p>

<i>Case study 2: Climate change and urban environment</i>		Aula Global
Cathryn Tonne		
Outline	<ul style="list-style-type: none"> • <u>Before the session</u>: Reading the following article: “How urban characteristics affect vulnerability to heat and cold: a multi-country analysis” • <u>During session</u>: <ul style="list-style-type: none"> ○ Exercise in small groups and presentation of results ○ Classroom discussion ○ Summary provided by professor 	
Mandatory reading (case study)	Sera F, Armstrong B, Tobias A, Vicedo-Cabrera AM, Åström C, Bell ML, et al. 2019. How urban characteristics affect vulnerability to heat and cold: a multi-country analysis. Int J Epidemiol 48:1101–1112; doi:10.1093/ije/dyz008.	Yes

<i>Lecture 5: Challenges for Planetary Health</i>		Aula Global
Cristina O’Callaghan		
Outline	<ul style="list-style-type: none"> • Main threats for human health in the Anthropocene • Challenges to achieve planetary health: <ul style="list-style-type: none"> ○ Conceptual challenges ○ Knowledge challenges ○ Implementation challenges 	
Recommended reading	Whitmee S, Haines A, Beyrer C, et al. Safeguarding human health in the Anthropocene epoch: report of The Rockefeller Foundation–Lancet Commission on planetary health. <i>Lancet</i> 2015; published online July 16. http://dx.doi.org/10.1016/S0140-6736(15)60901-1 . Pages: 1997, 2015-2019.	Yes
	Supplement to: Whitmee S, Haines A, Beyrer C, et al. Safeguarding human health in the Anthropocene epoch: report of The Rockefeller Foundation–Lancet Commission on planetary health. <i>Lancet</i> 2015; published online July 16. Appendix 3: 11. Challenges to achieving planetary health – expanded text.	Yes

SESSION 4 – 3rd February

<i>Lecture 6: Governance for a sustainable society</i>		Aula Global
Josep M. Antó		
Outline	<ul style="list-style-type: none"> • Transformative principles for a sustainable society • Agenda 2030: Sustainable Development Goals 	
Recommended reading	Independent Group of Scientists appointed by the Secretary-General, Global Sustainable Development Report 2019: The Future is Now – Science for Achieving Sustainable Development , (United Nations, New York, 2019).	Yes
	UN, Transforming our world: The 2030 agenda for sustainable development , United Nations 2015	Yes

<i>Seminar 2 - COVID-19, a disease of the Anthropocene</i>		Aula Global
Josep M. Antó and Cristina O’Callaghan		
Outline	<ul style="list-style-type: none"> • Visualization of the seminar organized by “El Día Después” to explore the linkages between global environmental change, COVID-19 and the progress towards the Sustainable Development Goals, followed by a classroom discussion. Find seminar here. • Classroom discussion 	Yes
Recommended reading	O’Callaghan-Gordo C, Antó JM. 2020. COVID-19: The Disease of the Anthropocene . Environ Res 109683; doi:10.1016/j.envres.2020.109683	Yes

<i>Case study 3: Environmental impacts of health systems</i>		Aula Global
Josep M. Antó		
Outline	<ul style="list-style-type: none"> • <u>Before the session</u>: Reading the following article: “The carbon footprint of Australian health care” • <u>During session</u>: <ul style="list-style-type: none"> ○ Exercise in small groups and presentation of results ○ Classroom discussion ○ Summary provided by professor 	
Mandatory reading (case study)	Malik A, Lenzen M, McAlister S, McGain F. 2018. The carbon footprint of Australian health care . Lancet Planet Heal 2:e2–e3; doi:10.1016/S2542-5196(17)30180-8.	Yes
Recommended reading	<p>Salas RN, Maibach E, Pencheon D, Watts N, Frumkin H. A pathway to net zero emissions for healthcare. BMJ 2020; 371: m3785</p> <p>Participants who do not know the most basic aspects of CO2 and GHG emissions can consult the following links:</p> <p>-Measuring carbon Footprints</p> <p>-CO₂ and Greenhouse Gas Emissions</p>	Yes

SESSION 5 - 10th February

<p><i>Case study 4. Sustainable development goals: case study on the Epidemic of Chronic Kidney Disease of unknown causes in Central America</i></p> <p>Oriana Ramírez and Cristina O’Callaghan</p>		<p>Aula Global</p>
<p>Outline</p>	<ul style="list-style-type: none"> • <u>Before the session</u>: Reading the following articles:”Mapping interactions between the sustainable development goals: lessons learned and ways forward.” (introduction to the methodology used in the session) and “Chronic Kidney Disease of Unknown Cause in Agricultural Communities” (introduction to CKDu, real, wicked and complex health problem”). • <u>During session</u>: <ul style="list-style-type: none"> ○ Visualization of a video presenting the complex problem of CKDu ○ Exercise in small groups using the “SDGs interlinkages mapping” and presentation of results ○ Classroom discussion ○ Summary provided by professor 	
<p>Mandatory reading (case study)</p>	<p>Johnson, R.J., C. Wesseling, and L.S. Newman, Chronic Kidney Disease of Unknown Cause in Agricultural Communities. N Engl J Med, 2019. 380(19): p. 1843-1852. https://pubmed.ncbi.nlm.nih.gov/31067373/</p> <p>Måns Nilsson , Elinor Chisholm , David Griggs , Philippa Howden-Chapman, David McCollum, Peter Messerli, Barbara Neumann, Anne-Sophie Stevance, Martin Visbeck, Mark Stafford-Smith. Mapping interactions between the sustainable development goals: lessons learned and ways forward. Sustain Sci. 2018;13(6):1489-1503. doi: 10.1007/s11625-018-0604-z. Epub 2018 Jul 13. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6267157/</p>	<p>Yes</p> <p>Yes</p>
<p>Recommended readings</p>	<p>UN, Department of Economic and Social Affairs. Sustainable Development Goals: https://sdgs.un.org/goals</p> <p>Gómez Martín E, Giordano R, Pagano A, van der Keur P, Máñez Costa M. 2020. Using a system thinking approach to assess the contribution of nature based solutions to sustainable development goals. Sci Total Environ 738:139693; doi:10.1016/j.scitotenv.2020.139693.</p> <p>Bennich T, Weitz N, Carlsen H. Deciphering the scientific literature on SDG interactions: A review and reading guide. Sci Total Environ. 2020 Aug 1;728:138405. doi: 10.1016/j.scitotenv.2020.138405. Epub 2020 Apr 8. PMID: 32388023.</p> <p>Saroj Jayasinghe, Yong-Guan Zhu. Chronic kidney disease of unknown etiology (CKDu): Using a system dynamics model to conceptualize the multiple environmental causative pathways of the epidemic. Science of The Total Environment, Volume 705,2020. https://doi.org/10.1016/j.scitotenv.2019.135766</p>	<p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p>

<i>Case study 5: Food systems - a Planetary Health approach</i>		Aula Global
Cristina O’Callaghan		
Outline	<ul style="list-style-type: none"> • <u>Before the session</u>: Reading the following case: “Today’s Solutions for the Future of Food” • <u>During session</u>: <ul style="list-style-type: none"> ○ Role playing exercise ○ Classroom discussion ○ Summary provided by professor 	
Mandatory reading (case study)	“ Today’s Solutions for the Future of Food ” (Duff H., Faerron Guzmán, C., Almada, A., Golden, C., and Myers, S. “ Planetary Health Case Studies: An Anthology of Solutions ” 2020, pages 314-359; https://doi.org/10.5822/phanth9678)”	Yes Yes
Recommended reading	Willett W, Rockström J, Loken B, Springmann M, Lang T, Vermeulen S, et al. 2019. Food in the Anthropocene: the EAT–Lancet Commission on healthy diets from sustainable food systems . Lancet 393:447–492; doi:10.1016/S0140-6736(18)31788-4.	Yes

<i>Co-creation activity for the Planetary Health course & mentoring</i>		Aula Global
Josep Maria Antó and Cristina O’Callaghan		
Outline	<ul style="list-style-type: none"> • <u>Before the session</u>: Think about your experience with the Planetary Health course, what did you like and what would you have liked to see. • <u>During session</u>: <ul style="list-style-type: none"> ○ Co-creation activity: <ul style="list-style-type: none"> ▪ Exercise in small groups ▪ Brainstorming activity ▪ Classroom discussion ○ Mentoring <ul style="list-style-type: none"> ▪ How to develop a professional career on Planetary Health? 	

SESSION 6 – 17th February

<i>Poster presentation</i> Cristina O’Callaghan & Josep M. Antó		Aula Global
Outline	<ul style="list-style-type: none">• The session will consist of 30 minutes viewing posters in display and ask questions individually• Selected abstracts will be presented and discussed during the rest of the session	-

BIBLIOGRAPHY AND INFORMATION RESOURCES

- Bennich T, Weitz N, Carlsen H. **Deciphering the scientific literature on SDG interactions: A review and reading guide**. *Sci Total Environ*. 2020 Aug 1;728:138405. doi: 10.1016/j.scitotenv.2020.138405. Epub 2020 Apr 8. PMID: 32388023.
- Crutzen PJ. 2002. **Geology of mankind**. *Nature* 415:23–23; doi:10.1038/415023a.
- Eckelman MJ, Sherman J. 2016. **Environmental Impacts of the U.S. Health Care System and Effects on Public Health**. *PLoS One* 11:e0157014; doi:10.1371/journal.pone.0157014.
- Eisenberg JNS, Desai M A, Levy K, Bates SJ, Liang S, Naumoff K, et al. 2007. **Environmental determinants of infectious disease: a framework for tracking causal links and guiding public health research**. *Environ Heal Perspectives* 115: 1216–23
- Gómez Martín E, Giordano R, Pagano A, van der Keur P, Máñez Costa M. 2020. **Using a system thinking approach to assess the contribution of nature based solutions to sustainable development goals**. *Sci Total Environ* 738:139693; doi:10.1016/j.scitotenv.2020.139693.
- Independent Group of Scientists appointed by the Secretary-General, **Global Sustainable Development Report 2019: The Future is Now – Science for Achieving Sustainable Development**, (United Nations, New York, 2019).
- IPBES (2019): **Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services**. S. Díaz, J. Settele, E. S. Brondízio E.S., H. T. Ngo, M. Guèze, J. Agard, A. Arneth, P. Balvanera, K. A. Brauman, S. H. M. Butchart, K. M. A. Chan, L. A. Garibaldi, K. Ichii, J. Liu, S. M. Subramanian, G. F. Midgley, P. Miloslavich, Z. Molnár, D. Obura, A. Pfaff, S. Polasky, A. Purvis, J. Razzaque, B. Reyers, R. Roy Chowdhury, Y. J. Shin, I. J. Visseren-Hamakers, K. J. Willis, and C. N. Zayas (eds.). IPBES secretariat, Bonn, Germany. 56 pages.
- IPCC, 2018: **Summary for Policymakers. In: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty** [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)]. World Meteorological Organization, Geneva, Switzerland, 32 pp.
- Johnson, R.J., C. Wesseling, and L.S. Newman, *Chronic Kidney Disease of Unknown Cause in Agricultural Communities*. *N Engl J Med*, 2019. **380**(19): p. 1843-1852. <https://pubmed.ncbi.nlm.nih.gov/31067373/>
- Landrigan PJ, Fuller R, Acosta NJR, Adeyi O, Arnold R, Basu N (Nil), et al. 2018. **The Lancet Commission on pollution and health**. *Lancet* 391:462–512; doi:10.1016/S0140-6736(17)32345-0.
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