
Maria Cristina Rulli

Full Professor of Hydrology

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Dr. Maria Cristina Rulli is full professor in hydrology at the Politecnico di Milano, Department of Civil and Environmental Engineering since 2019. Previously she has been an associate professor (2013-2019), an assistant professor (2006-2012) at the Politecnico di Milano. She teaches the course on “Water and Food Security” and on “Climate and Global Change in the Age of Sustainable Development within the Environmental Engineering programs, and the course on “Climate and Hydrology” within the Architecture and Urban Planning program at the Politecnico di Milano. She teaches also the course on “Sustainable Water and Food Security” within the Doctoral Program in Environmental and Infrastructure Engineering and High Level Training Program “Honours Programme Engineering for Sustainable Development” (Politecnico di Milano) and the course on “Resource Planning and Management within Sustainable Development: a focus on the Water, Energy, Food and Climate Nexus” open to all the Doctoral Program students at the Politecnico di Milano. She is author of a more than 90 peer-reviewed papers (Hirsh Index 30) in the fields of hydrology, fluvial geomorphology, hillslope hydrology and stability, global water resources, and assessments of other natural resources under a variety of global change scenarios, such as climate change, deforestation, urbanization, land degradation, population growth, and changes in dietary shifts in dietary preferences, and changes in energy policies. Her most recent research work focuses on the Food-Energy-Water Nexus and environmental sustainability issues with particular emphasis on the emergent phenomenon of Large Scale Land Acquisition (LSLA) and the consequent impacts on water, energy and food security. In particular, her research has helped to clarify the effects of anthropogenic and natural disturbances such as land use change, climate change, forest fires, and new infrastructures on both the hydrological response and sediment yield of a variety of watersheds at different spatial and temporal scales. Her work has contributed both to experimental (field and lab based research) and numerical investigations focusing on different geographic regions across Europe, Asia, North and South America. She designed a rainfall simulator to generate (artificial) precipitation on large (up to about 100 m ×100 m) and steep (slope up to 35°) plots. This generator is suitable for studies of runoff generation, soil erosion and sediment transport both in the presence and absence of fire-induced disturbance. She developed distributed models of hydrologic response, triggering of shallow landslides, soil and erosion and sediment transport at different spatial scales. She has used these models to evaluate the effects of human activities on the risk of hydrologic disasters. Recently, she has been investigating the impact of climate change, urbanization, deforestation, land degradation, population growth, changes in food consumption, changes in energy policies on the management of water and other natural resources. Her work has investigated the effect of environmental externalities, interdependencies and teleconnections on natural resource availability. She is analysing water and food security and environmental sustainability issues using the Food-Energy-Water Nexus perspective. In particular, she has focused on the emergent phenomenon of Large Scale Land Acquisition (LSLA) and its implication for water, energy and food security. Her work has defined and quantified the global phenomenon of “water grabbing” and explored its impacts on water governance, rural livelihoods, and the emergence of water conflicts. These original contributions have led to a number of highly influential research articles that have been broadly cited in the scholarly literature, policy documents and the media. For this research she has developed a global hydrologic model that estimates the amount of rainwater consumed by the 26 major crops (>80% cultivated area) around the world and the corresponding irrigation water requirements. She has used his global model to evaluate the phenomenon of global water grabbing, the amount of needed to close the yield gap (i.e., the difference between actual and potential yields) in cultivated regions around the world, and to assess the sustainability of the associated water withdrawals from surface water bodies and aquifers.

1) Education/Training

Year of completion	Title or activity	Institution
1991	Undergraduate degree	University of Perugia
1994	Graduate degree (MSc)	University of Perugia
1999	Graduate degree (DR, PhD)	Politecnico di Milano
2002	Post-Doctoral	Politecnico di Milano

2) Professional History

2018-ongoing	Full Professor, Politecnico di Milano, Milano, Italy
2013-	Associate Professor, Politecnico di Milano, Milano, Italy.
2002-2013	Assistant Professor, Politecnico di Milano, Milano, Italy.
2013	Visiting at University of Virginia
2012	Adjunct researcher, National Research Council-Biometeorology division, Sassari, IT.
1999-2002	Research Associate, Politecnico di Milano
1998	Research Associate, University of California at Berkeley, Berkeley, USA.

Special academic/ professional activities

2017-ongoing	member of the board and tutor of the High Level Training Course of the Politecnico di Milano " <i>Honours Programme Engineering for Sustainable Development</i> ".
2018-ongoing	Co-coordinator of the Politecnico di Milano transdisciplinary nucleus " <i>Food Sustainability Research and INnovation Group (Food RING)</i> "
2018-ongoing	Member of AVA-ANVUR (Evaluation of research and teaching activities) commission of the School of Civil and Environmental Engineering of Politecnico di Milano.
2017- ongoing	Associate editor the scientific journal "Frontiers"
2017	Guest Editor of the scientific journal "Advances Water Resources"
2017-ongoing	Elected member of the Council of the Department of Civil and Environmental Engineering
2016- ongoing	Elected member of the scientific committee of the Italian Society of Hydrology
2015-ongoing	Member of the steering committee of the Interdisciplinary research centre on Sustainability and Human Security:Co-Operation & Governance Agendas
2014	Co-author of the "National Climate Change Adaptation Strategy" Ministry of Environment, Land and Sea Protection of Italy. Rome, 2014
2013-2015	Principal tutor of the multidisciplinary project <i>SCIENCe (Security in Global Environmental Changes)</i> at the High Level Training Course of the Politecnico di Milano " <i>Alta Scuola Politecnica</i> "
2011-ongoing	Deputy coordinator of the Italian Group of Hydraulics; international cooperation on hydraulic and hydrologic issues division.
2011-ongoing	Member of the Doctoral School in Environmental and Infrastructural Engineering
2013	Coordinator of the Experts Evaluation Panels (Area ERC PE808) of Research Proposals "Future of Research". Ministry of Education, University and Research - MIUR (Italy). Decree of Minister of Education, University and Research (July 23, 2013)
1999- ongoing	Reviewer for international scientific journals (WRR, AWR, PNAS, Scientific Reports, Geomorphology, Nature Geoscience, BioScience, etc) and agencies (MIUR; European Science Foundation, ASI, Swiss Science Foundation, CARIPLO Foundation)

3) List of the most relevant scientific results,

- Rulli M.C., Saviatori A., D'Odorico P. (2013). Global land and water grabbing. *Proceedings of the National Academy of Science of the United States of America*, 110, 892-897, 10.1073/pnas.1213163110
- Rulli, M.C. P. D'Odorico (2014). Food appropriation through large scale land acquisitions. *Environmental Research Letters*, vol. 9, p. 1-8, ISSN: 1748-9326, doi: 10.1088/1748-9326/9/6/064030.
- D'Odorico, P., Rulli, M.C. (2013). The fourth food revolution. *Nature Geoscience*, vol. 6, p. 417-418, 10.1038/ngeo1842
- D'Odorico, P., M.C. Rulli (2014). The land and its people. *Nature Geoscience*, vol. 7, p. 324-325.
- Davis K. F., Yu K., Rulli M.C., Pichdara L., D'Odorico P. (2015). Accelerated deforestation driven by large-scale land acquisitions in Cambodia. *Nature Geoscience*, vol. 8, p. 772-775, 10.1038/ngeo2540.
- Rulli M.C., Bellomi D., Cazzoli A., De Carolis G., D'Odorico P. (2016) The water-land-food nexus of first-generation biofuels. *Scientific Reports*, 6, Art. num. 22521, doi:10.1038/srep22521
- Rulli M.C., Santini M., Hayman D.T.S., D'Odorico P. (2017) The nexus between forest fragmentation in Africa and Ebola virus disease outbreaks. *Scientific Reports* 7: 41613. doi: 10.1038/srep41613.
- Davis K.F., MC Rulli, A Seveso, P D'Odorico (2017) Increased food production and reduced water use through optimized crop distribution, *Nature Geoscience* 10 (12), 919
- D'Odorico P., Davis K.F., Rulli M.C. (2018) The Global Food-Energy-Water Nexus, *Review of Geophysics*, 56, 3, 76 pages, <https://doi.org/10.1029/2017RG000591>.
- Davis K.F., Chiarelli D.D., Rulli M.C., Chhatre A., Richter B., Singh D., Defries R. (2018) Alternative cereals can improve water use and nutrient supply in India, *Science advances*, 4 (7), eaao1108.
- Rulli, M.C., Casirati S., Dell'Angelo J., Davis, K. F., Passera C., D'Odorico, P (2019) Interdependencies and teleconnections of oil palm expansion at the expense of Indonesian rainforest, *Renewable and sustainable energy reviews*, 105, 499-512,
- Rosa, L., Chiarelli, D.D., Rulli, M.C., Dell'Angelo, J., D'Odorico, P. (2020) Global agricultural economic water scarcity, *Science Advances*, 6 (18), art. no. eaaz6031.
- Chiarelli D.D., Passera C., Rosa L., Davis K.F., D'Odorico P., & Rulli M.C., (2020), Global gridded dataset of crop-specific green and blue water requirements, the WATNEEDS model, *Scientific data*, 7, 273 (2020). <https://doi.org/10.1038/s41597-020-00612-0>
- D'Odorico p., Chiarelli D.D., Rosa L., Bini A., Zilberman D., Rulli M.C. (2020) The global value of water in agriculture, *Proceedings of the National Academy of Sciences*, 117 (36) 21985-21993; <https://doi.org/10.1073/pnas.2005835117>.
- Rosa L., Rulli M.C., Ali S., Chiarelli D.D., D'Odorico P. (2021) Energy implications of the 21st century agrarian transition. *Nature Communications*, 12, 2319 (2021). <https://doi.org/10.1038/s41467-021-22581-7>.
- Müller M.F., Penny G., ... Rulli M.C., Mueller N.D. (2021) Impact of transnational land acquisitions on local food security and dietary diversity, *Proceedings of the National Academy of Sciences*, 118 (4) e2020535118.
- Rulli M.C., D'Odorico P., Galli N., Hayman D.T.S. (2021) Land use change and livestock revolution as contributors to Coronavirus emergence risk, *Nature Food*, 2, 409–416 (2021). <https://doi.org/10.1038/s43016-021-00285-x>.

4) Current research grants awarded by any agency or company to the researcher.

1994 Magna Cum Laude distinction, University of Perugia, Italy.

2002 Prize on Environmental Friendly Innovation for the research on "River Fusegates", granted by Fondazione Legambiente, Milano, Italy.

2003 Young Researcher Award given for the research on *Analysis of Hydrological Response and Erosion on Burned Areas*, granted by National Institute for Mountain Research.

5) List of ongoing supervisions, with students holding fellowships.

Since 2017 M.C. Rulli is member of the scientific board of the high level training program “Honours Programme Engineering for Sustainable Development” at the Politecnico di Milano. (23 students per year). In 2013-2015 she was the principal tutor of the SCIENCE (Security in Global Environmental Changes) multidisciplinary project at the honour training course of the Politecnico di Milano “Alta Scuola Politecnica” M.C. Rulli has supervised and co-advised 34 Master students, 9 PhD students and 3 PostDocs. Three of MSc thesis obtained respectively in 1999;2000 and 2003 the CIRITA award as the best Master thesis for the academic year and one thesis obtained in 2007 the “City and Security” award as best master thesis in the academic year. In 2016 another thesis received the prestigious SPE (Society of Petroleum Engineers) mention as best master thesis of the year in analysing the impact of energy production on water resources. M.C. Rulli has also advised and co-advised 9 Ph.D. students and two PostDocs. Three of these received the cum magna laude distinction for their PhD thesis.

6) Academic quantitative indicators

Total scientific journal papers: 100

Book chapters: 4

Number of Peer reviewed papers: 97 (4 highly cited papers)

Hirsch Index (H Index): 32 Source: Scopus® Elsevier database

Citations 2856 Source: Scopus® Elsevier database

VQR2011-2014 (Evaluation of the Quality of Research by the National Agency for University and Research Evaluation, ANVUR): Excellent (3/3)

VQR2004-2010 (Evaluation of the Quality of Research by the National Agency for University and Research Evaluation, ANVUR): Excellent (3/3)

ORCID ID: <https://orcid.org/0000-0002-9694-4262>

7) Links to the web pages ORCID

<https://orcid.org/0000-0002-9694-4262>

6) Fund raising activity

2021-2024 NEXUS-NESS NEXUS Nature Ecosystem Society Solution: Fair and Sustainable Resource Allocation Demonstrator of the Multiple WEF E Nexus Economic, Social and Environmental Benefits for Mediterranean Regions- Project granted by European Union

2019-2023 AWESOME- mAnaging Water, Ecosystems and food across sectors and Scales in the sOuth Mediterranean. Project granted by European Union

2019-2023 NEWAVE_ Next WAtER GoVERNance (NEWAVE) H2020 Marie Sklodowska-Curie Innovative Training Network (NEWAVE). Project granted by European Union

2018-2020 Mapping the HYdrological Control on shallOw landSliding (MHYCONOS) Project funded by CARIPO Foundation.

2018-2020 Sustainable MAnagement of sediment transpoRT in responSE to climate change conditions (SMARTSED), Project funded by CARIPO Foundation.

2016-2018 Hydrogeological modeling for Erosion Risk Assessment from SpacE (HERASE). Project funded by CARIPO Foundation

2013-2014. Energy-Water-Food nexus in grabbed areas. Project funded by ENEL Foundation.

2012-2013. Land grabbing in Africa" Grant to Support Research on Foreign Direct Investment (FDI) In Land, Land Markets and Land Institutions, and Development of the Agricultural Sector in Africa. Project funded by AGRODEP and International Food Policy Research Institute (IFPRI).

2011-2012. MIIUR (Methodologies and Indicators for forest fire risk in the Mediterranean urban-rural interface). Project funded by Sardinia Region (L.R.n.712007). t

2010-2013 SHARE-STELVIO. Un Parco-Osservatorio per lo studio dei Cambiamenti Climatici e Ambientali in alta quota. [A park observatory for studies of climate change at high altitudes].

2010- 2013. Share-Paprika. Effects of climate change on water resources Karakoram range (Pakistan, Asia). Funded by EVK2CNR committee. Several working units. r

2010. I CARE: Impact of Climate change on Alpine water REsources: the case of Italy and Switzerland.

2011. Reclamation of the Urban centre, sewage and water supply systems of the city of Multan (Pakistan, Asia). Funded by EVK2CNR committee of Italy. Several working units.

2010. Cooperación técnica no reembolsable ATN/OC-11996 Chile, Programa plan de acción para la conservación de glaciares ante el cambio climático, DGA-BID, Dirección General de Aguas, Ministerio de Obras Públicas. Grant awarded to EVK2CNR,

2007-2009 CARiPanda, Climatic change and water resources in the Adamello park, funded by Cariplo Foundation. <http://www.parcoadamello.it/files/Progetto%20CARIPANDA.pdf>.

2005-2008 AWARE: a tool for monitoring and forecasting Available WAter REsource in mountain environment. GMES – Global Monitoring for Environment and Security FP6–2003–SPACE–1

2005-2008 Integral Risk Management of Extremely Rapid Mass Movements "IRASMOS" European project. SUSTDEV-2004-3.IV.1.3 Long-term forecasting of landslides and avalanches..

2003-2005. Hydrological and sedimentological response in burned watershed. Project funded by National Institute for Mountain Research (INRM). r

2003-2004 INTERREG 3B DESERNET- Regione Liguria. EU project on Desertification in Mediterranean Environment.

9. Other information.

Third Mission: dissemination of research findings to general public

Politecnico di Milano supports the University's "Third Mission", whereby the Politecnico is committed in reaching out to the general public and explain the complex relationship existing among science, innovation, technology and socio-economic systems. M.C. Rulli's work has contributed to such a "Third Mission" through teaching to elementary, middle and high school students the basis of water cycle, the relationship existing between water and food production, the complex issues related to resource scarcity and the societal impacts of global environmental change. She also gives seminars on these topics to associations like Rotary club, Best, Alliance, and Lions.

Some of her research findings were reported by the media, general public articles and policy documents:

Quirin Schiermeier 'Grabbed' land has potential to feed millions, Nature doi:10.1038/nature.2014.15471. <https://www.nature.com/news/grabbed-land-has-potential-to-feed-millions-1.15471>.

PNAS First Look Bog: <http://firstlook.pnas.org/water-controlled-wealth-of-nations/#more-332>.

Damian Carrington "Land taken over by foreign investors could feed 550m people, study finds", The Guardian, 27 June 2014 <https://www.theguardian.com/environment/2014/jun/27/land-grabbing-food-biofuels-crops>

Fred Pearce "Ethical land grabbing' could feed 550 million people", New Scientist, 27 June 2014, <https://www.newscientist.com/article/dn25800-ethical-land-grabbing-could-feed-100-million-people/>

Brian Bienkowski "Corporations Grabbing Land and Water Overseas" Scientific American February 12, 2013, <https://www.scientificamerican.com/article/corporations-grabbing-land-and-water-overseas/>

Tom Rudell "Land-use change: Deforestation by land grabbers" Nature, doi:10.1038/ngeo2549. <https://www.nature.com/articles/ngeo2549>

Brad Plumer "Chinese firms and Gulf sheiks are snatching up farmland worldwide. Why?" Washington Post <http://www.washingtonpost.com/blogs/wonkblog/wp/2013/01/26/chinese-firms-and-gulf-sheiks-are-grabbing-farmland-worldwide-why/>

Ryan Jacobs, "The top 5 land grabbing countries" Mother Jones, <http://www.motherjones.com/blue-marble/2013/01/top-land-grabbing-countries> Feb 6, 2013.

Laura Ferriccioli "La grande caccia all'acqua" Panorama, 30 January 2013, <https://www.panorama.it/news/esteri/risorse-idriche-la-grande-caccia-all-acqua/>

"Land grabbing: più del neocolonialismo, devastante per l'ambiente" Corriere della sera, 28 January 2013, https://www.corriere.it/ambiente/13_gennaio_29/land-grabbing-devastazione-ambiente_273138da-6960-11e2-a947-c004c7484908.shtml

Famiglia Cristiana Interview on land and water grabbing: Famiglia Cristiana <http://www.famigliacristiana.it/informazione/i-grandi-servizi/dossier/watergrabbing.aspx>

Policy documents

European Commission. Science for Environment Policy, "With the land goes the water: 'land grabbing' redistributes global water resources", 21 Feb. 2013.

The Publications Office of the European Union. New ways of providing knowledge to tackle food and nutrition security - EU Law and Publications 2016

Food and Agriculture Organization of the United Nations "Status of the World's Soil Resources. FAO 2016

Deininger, Klaus; Xia, Fang. 2017. Assessing Effects of Large-Scale Land Transfers : Challenges and Opportunities in Malawi's Estate Sector. Policy Research Working Paper; No. 8200. World Bank, Washington, DC. © World Bank. <https://openknowledge.worldbank.org/handle/10986/28378> License: CC BY 3.0 IGO."

Milano, 22 Giugno 2021