

Environmental Consultant

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EDUCATION

University of California Berkeley, CA, USA	1964 - 1969	Ph.D. physics June 1969* M.A. physics Jan. 1966
Beloit College Beloit, WI, USA	1961 - 1963 on Fulbright Scholarship	B.Sc. math and physics June 1963 magna cum laude and Φ BK

* Ph.D. thesis: "Topics in Current Algebra and Electromagnetic Interactions" (= items III.1, III.2 and IV.1 of publication list)

EMPLOYMENT

(* = with teaching assignments)

(overlap in dates due to leaves of absence or concurrent appointments)

Ecole Nationale Supérieure des Mines Centre d'Energétique, 75272 Paris 06 Responsable scientifique (Senior Scientist) *		visit 1986 permanent since 1988 <i>until obligatory retirement at 65, in 2007</i>
University of Colorado Dept. of Civil Engineering, Boulder, CO 80309-0428 Research Professor 1996-2001, Professor Adjoint 1992-96		Concurrent Position 1992-2001
Princeton University Center Energy & Environ. Studies (now Princeton Environmental Institute), Princeton, NJ 08544 Research Scientist and Lecturer (rank equiv. to Associate Prof.)*		1980 - 1989
National Renewable Energy Laboratory Golden, CO 80401 Senior Scientist (1978 - 1979), Principal Scientist (1980 - 1981)		1978 - 1981
University of Chicago Enrico Fermi Institute, Chicago, IL 60637	Senior Research Associate	Concurrent Position 1976 - 1982
Argonne National Laboratory Solar Energy Group, Argonne, IL 60439 Assistant Physicist (1974 - 1977), Physicist and Mech. Engineer (1977 - 1980)		1974 - 1980
Ohio State University Dept. of Physics, Columbus, OH 43210	Research Associate *	1972 - 1974
Weizmann Institute Dept. of Physics, Rehovot, Israel	Research Associate *	1970 - 1971
University of California Dept. of Physics, Berkeley, CA 94720	Teaching and Research Assistant *	1964 - 1969

***courses taught:**

- introductory math and physics
- systems for lighting, heating and cooling

- physics for liberal arts students
- theoretical high energy physics
- heat transfer
- design of renewable energy systems
- energy and environment
- environmental impacts

Frank Kreith Energy Award of the American Society of Mechanical Engineers, 2008.

PERSONAL DATA

Citizen of USA and France trilingual (English, French, German)

Avocation: reading; enjoyment of the arts; travel

SYNOPSIS OF RESEARCH EXPERIENCE

(numbers in parentheses refer to list of publications)

ENVIRONMENTAL IMPACTS

analysis of impacts and risks:

- Presented a detailed description of the methodology and key results in a book with J. V Spadaro and M. Holland, published by Cambridge University Press (I.1).
- Coordinated a multidisciplinary international team (“SusTools” project of EC DG Research) to develop tools for sustainable development (IV.17).
- Coordinated a multidisciplinary international team (“Environmental Risk” project of EC DG Research) to evaluate the objective risks of controversial installations such as waste incinerators, study the perception of these risks by the public, and see how this information can be used to improve the decision process about such installations (IV.15).
- Coordinated a large multidisciplinary team to evaluate the impacts and external costs of fuel cycles (nuclear and fossil) in France (IV.14, II.17, II.18, III.73, III.74)
- Developed general relationships for impacts of air pollution (dependence on site and emission height, geographic range, sensitivity to local detail) (III.67, III.78)
- Participated in development of the software packages (PathWays and RiskPoll) for analysis of environmental impacts (IV.13, II.14)
- Evaluated environmental damages and costs of waste treatment (incineration and landfill) (III.70, III.104)
- Evaluated environmental damages and costs of several vehicle types (conventional, natural gas, hybrid, electric) (III.68, III.79, III.84, III.86)
- Evaluated air pollution damage to buildings (III.76, II.23)
- Analyzed uncertainty of air pollution damage estimates (III.75, III.93, III.103)

environmental economics:

- Participated in projects to determine reference value of life for external costs (III.64, III.99 and III.108)
- Showed that conventional practice of discounting must be modified for long term costs if one wants to be fair to present and to future generations (III.66)
- Cost–benefit analysis of climate change dynamics (III.106)

ENERGY ECONOMICS and TECHNOLOGY ASSESSMENT

energy economics:

- Compared environmental benefits of PV with R&D cost (III.90, III.92)

- Analyzed and compared subsidies for the encouragement of new energy technologies (III.36)
- Developed simple framework for evaluating two important aspects of energy investments: penalties for misoptimization due to uncertainty, and mismatch between perspectives of individual and society (III.39)

technology assessment:

- Evaluated gas turbine, diesel, fluidized bed coal/steam, and other cogeneration systems to select best candidate for the new central plant of the Princeton University campus (III.42)
- Evaluated cost-effectiveness of luminaires (III.46)
- Carried out assessment of solar industrial process heat (IV.5)

APPLIED PHYSICS and ENGINEERING

system analysis:

- Analyzed value of savings from energy storage (chapter 15 of I.1)
- Improved system design for heat pump water heaters (IV.11)
- Analyzed systems for solar industrial process heat and proposed single-pass design, showing that it can be up to twice as efficient as the conventional multiple-pass design (III.29, 33 and 38)

energy use in buildings:

- Monitored energy use in office buildings, compared results with theoretical models, proposed and evaluated retrofit measures (II.9, III.44 and IV.6 to 10)
- Tested the applicability of the principal methods of system identification to energy data of buildings (III.45 and 52)
- Proposed and evaluated peak load management utilizing the heat capacity of buildings, based on system identification and optimal control (III.51)
- Analyzed energy use by office equipment and lighting (II.8)
- Optimized building design, including both envelope and equipment for heating and cooling (III.43 and chapter 14 of I.2)

experimental tests of energy systems and components:

- Analyzed and tested ice pond for production and seasonal storage of ice for air conditioning (III.40)
- Designed, analyzed and tested new solar collectors (III.28)
- Proposed and tested flow system for solar ponds (III.17)
- Evaluated optical quality of concentrator (III.27)
- Measured incidence angle modifier of parabolic trough solar collector (III.25)

solar energy:

- Analyzed use of solar ponds for space heating (III.8 and 9)
- Developed shorthand procedures for design and analysis of solar energy systems (II.6 and 7)
- Carried out statistical analysis of solar water heater tests and evaluated accuracy of test procedure.(III.48 and 49)
- Optics and heat transfer of concentrating solar collectors (see optics and experimental tests)

solar radiation data:

- Carried out systematic reevaluation and refinement of the correlations needed for the utilizability method of predicting the performance of solar collectors (III.22 to 24)
- Developed simple model for annual utilizability of solar radiation (III.32)

- Developed simple model for frequency distribution of solar radiation (III.31)

optics:

- Developed methodology for design of reflectors that achieve exactly any specified illuminance distribution on a target surface, for a given extended source of radiation (III.57-61)
- Designed novel reflectors for solar collectors, radiant heaters and lighting systems (III.14, 41, 50, 53-56, and patents V.4 to V.11)
- Analyzed optical performance of solar concentrators (III.10, 21, 26, 30, 34 and 35)
- Developed simple method for optical analysis of glass tubes (III.15)
- Developed simple method for optical analysis of specular radiation passages (III.16)

THEORETICAL PHYSICS

- Developed perturbation theory for magnetic monopoles (III.2)
- Explored consequences of the dual resonance (Veneziano) model (III.3, 5 and 6)
- Analyzed Rho-Omega interference experiments (III.7)

Coordination of EU Research Projects

Project + Agency	Total amount	Duration
"Tools for sustainability: Development and application of an integrated framework". Multinational project, funded by European Commission	478 k€	1.5 yrs 2003 - 04
"Externalities of Energy: Extension of accounting framework and Policy Applications". Multinational project, funded by European Commission	578 k€	2 yrs 2002 - 04
"Impact assessment and authorization procedure for installations with major environmental risks". Multinational project, funded by European Commission + Ministère de l'Environnement	534 k€	3 yrs 1996 - 99
"External costs of fuel cycles: implementation of the Accounting Framework in France". and "Dissemination of external costs Accounting Framework". Multinational projects, funded by European Commission.	290 k€	2 yrs 1993 - 95
"Nonimaging optics reflector designs". Electric Power Research Institute, USA + Agence Française de l'Environnement et de la Maîtrise de l'Energie + ANVAR.	k\$ 440	4 yrs 1992 - 95

OTHER ACTIVITIES

Energy advisor for Princeton University physical plant, 1981 - 1988

Associate editor *ASME J. of Solar Energy Engineering*, 1983 - 1987.

Associate editor *Solar Energy*, 1995-2005.

Member, Editorial Committee, *Pollution Atmosphérique*.

Consulting (partial list): International Atomic Energy Agency, Vienna;
International Finance Corp (World Bank Group), Washington, DC, USA;
Toyota Motor North America, Washington, DC, USA;
Institut Véolia Environnement, Paris;
Institute for Desert Research, Ben Gurion University, Israel;

Professional Societies American Physical Society;
Society for Risk Analysis
Federation of American Scientists.
Intern. Soc. For Environmental Epidemiology

PUBLICATIONS

I. BOOKS and COLLECTIVE VOLUMES

- I.1. A. Rabl, J. V. Spadaro and M. Holland. 2014. *How Much is Clean Air Worth? Calculating the Benefits of Pollution Control*. 671 p. Cambridge University Press, July 2014.
- I.2. A. Rabl. 2007. *Contingent Valuation*. Special issue of *Revue d'Economie Politique*, Vol.117. A Rabl, guest editor. 218 p. Paris. Dec. 2007.
- I.3. R. Lefèvre and A Rabl. 2007. *Effets de la pollution atmosphérique sur les matériaux (Effects of atmospheric pollution on materials)*. Special issue of *Pollution Atmosphérique*, R. Lefèvre and A Rabl, guest editors. 111 p. Paris. Oct. 2007.
- I.4. A Rabl. 2001. *Combien vaut l'air propre? - How much is clean air worth?* Special bilingual issue of *Pollution Atmosphérique*, A Rabl, guest editor. 184 p. Paris. Dec. 2001.
- I.5. JF Kreider and A Rabl. 1994. *Heating and Cooling of Buildings: Design for Efficiency*. JF Kreider and A Rabl. 890 p. McGraw-Hill, New York. 1994. 2nd edition, JF Kreider, PS Curtiss and A Rabl. 877 p. McGraw-Hill, New York. 2002. Revised 2nd edition, JF Kreider, PS Curtiss and A Rabl. 843 p. CRC Press, Boca Raton, FL. 2010.
- I.6. A. Rabl. 1985. *Active Solar Collectors and Their Applications*. 503 p. Oxford University Press, New York. 1985.

II. REVIEW ARTICLES

- II.37. A. Rabl and J. V. Spadaro. 2016. "Damage Costs of Air Pollution and Policy Implications". *Comprehensive Analytical Chemistry*, Volume 73_chapter 33, 2016, in press.
- II.36. A. Rabl and J. V. Spadaro. 2016. "External Costs of Energy: How Much is Clean Energy Worth?". *J. Solar Energy Engineering*, 2016, in press.
- II.35. contributing author to "Renewable Energy in the Context of Sustainable Development". Chapter 9 of *IPCC Special Report on Renewable Energy Sources and Climate Change Mitigation*. Intergovernmental Panel on Climate Change, Aug.2011.
- II.34. Brink C, van Grinsven H, Jacobsen BH, **Rabl A**, Gren I-M, Holland M, Klimont Z, Hicks K, Brouwer R, Dickens R, Willems J, Termansen M, Velthof G, Alkemade R, van Oorschoot M, Webb J. 2011. "Costs and benefits of nitrogen in the environment". Chapter 22, pp.513-540, of *The European Nitrogen Assessment: Sources, Effects and Policy Perspectives*. Sutton MA, Howard CM, Erisman JM, Billen G, Bleeker A, Grennfelt P, van Grinsven H and Grizzetti B, editors. Cambridge University Press, Cambridge, UK.
- II.33. Brander L, Fall EH, Friedrich R, Hirschberg S, Kuik O, Magnussen K, Navrud S, Preiss P, **Rabl A**, and van der Zwaan B. 2010. "External Costs". Chapter 1, pp.3-76, of *The Social Cost of Electricity*, Markandya A, Bigano A and Porchia R, editors. FEEM Series on Economics, Edward Elgar Publishing Ltd, Cheltenham, UK.

- II.32. Rabl A, Spadaro JV and Bachmann TM. 2010. "Estimating environmental health costs: Monetary valuation of trace pollutants". *Environnement, Risques & Santé – Vol. 9, n° 2, mars-avril 2010*. A very similar version has also been published as "Monetary valuation of trace pollutants". In: Nriagu JO (ed.) *Encyclopedia of Environmental Health*, volume 3, pp. 856–869 Burlington: Elsevier.
- II.31. Spadaro JV and Rabl A. 2007. "Environmental impacts and costs of energy". pp.4.1 to 4.22. *Handbook of Energy Efficiency and Renewable Energy*, F Kreith and Y Goswami, editors. CRC Press, Taylor & Francis Group, Boca Raton, FL 33487-2742.
- II.30. Rabl A & Spadaro JV. 2006. "Environmental impacts and costs of energy". *Annals New York Academy of Sciences* n°1076, p.516-526 (2006).
- II.29. Rabl A. 2005. "Analyse coût-bénéfice du contrôle de la pollution: nécessité, méthodologie et exemples" (Cost-benefit analysis for pollution control: necessity, methodology and examples). *Économie et Prévision* n°167 (1), p.1-12 (2005).
- II.28. Rabl A. 2005. "How Much to Spend for the Protection of Health and Environment: A Framework for the Evaluation of Choices". *Les Cahiers de l'Institut Véolia Environnement* (bilingual issue, with French version "Combien dépenser pour la Protection de la Santé et de l'Environnement: un cadre pour l'évaluation des choix"). Paris, Dec.2005.
- II.27. Rabl A & Spadaro JV. 2005. "Les coût externes de l'électricité". Chapter 28, pp.583-606, *L'Énergie de Demain*, edited by JL Bobin, E. Huffer and H Niffenecker. EDP Sciences - Grenoble Sciences, Université Joseph Fourier, Grenoble, France. 2005.
- II.26. A Rabl and JF Kreider, with RRH Cohen, N Cook, PS Curtiss, T Illangasekare, J Firor, and P Zannetti. 2005. "Environmental Engineering". 57 pp. Chapter 16 of *CRC Handbook of Mechanical Engineering*, 2nd edition. F. Kreith, editor. CRC Press, Inc. Boca Raton, FL 33431 (2005).
- II.25. Rabl A & Spadaro JV. 2002. "Health Impacts of Waste Incineration". *Issues in Environmental Science and Technology*, Vol.18 *Environmental Impact of Solid Waste Management Activities*, 171-193 (2002). Royal Society of Chemistry, UK.
- II.24. Friedrich R, **Rabl A** & Spadaro JV. 2001. "Quantifying the Costs of Air Pollution: - The ExternE Project of the European Commission". *Pollution Atmosphérique*, Special Issue Dec. 2001, 77-104.
- II.23. Watkiss P, Eyre N, Holland M, **Rabl A** & Short N. 2001. *Pollution* "Impacts of air pollution on building materials". *Atmosphérique*, Special Issue Dec. 2001, 139-153.
- II.22. Rabl A & Spadaro JV. 2001. « Les coûts externes de l'électricité ». *Revue de l'Énergie*, No.526, p.151-163, mai 2001. This paper has also been reprinted as Chapter 28, pp.583-606, of *L'Énergie de Demain: Techniques, Environnement, Économie*, JL Bobin, E Huffer & N Nifenecker, editors, Grenobles Sciences Rencontres Scientifiques (2005).
- II.21. Rabl A & Fusaro P. 2001. "Economic and Financial Aspects of Distributed Generation", pp.203-247 of *Distributed Generation: the Power Paradigm for the New Millenium*. A-M Borbely & JF Kreider, editors. CRC Press, Boca Raton, Florida. (2001)
- II.20. Rabl A. 2001. "Economics and Costing of HVAC Systems", pp.3.26-3.62 of *Handbook of Heating, Ventilating and Air Conditioning*. JF Kreider, editor. CRC Press, Boca Raton, Florida. (2001)
- II.19. Rabl A. 2001. "Energy Calculations – Building Loads", pp.6.1-6.52 of *Handbook of Heating, Ventilating and Air Conditioning*. JF Kreider, editor. CRC Press, Boca Raton, Florida. (2001)
- II.18. Rabl A & Spadaro JV. 2001. "The Cost of Pollution and the Benefit of Solar Energy". pp.437-475. *Solar Energy: the State of the Art*. JM Gordon editor. International Solar Energy Society, James & James (Science Publishers) Ltd, London, UK. (2001).
- II.17. Rabl A & Spadaro JV. 2000. "Public Health Impact of Air Pollution and Implications for the Energy System". *Annual Review of Energy and the Environment*, vol.25, 601-627 (2000).

- II.16. **Rabl A**, JM Gordon, OP Teng, H Ries and R Winston. 1999. "Tailored edge-ray designs for illumination with extended sources". *Recent Research Developments in Optical Engineering*, vol.2, 351-381 (1999).
- II.15. JF Kreider, RRH Cohen, N Cook, PS Curtiss, T Illangasekare, F Kreith, **A Rabl** and P Zannetti. 1998. "Environmental Engineering", 64 pp. Chapter 16 of *CRC Handbook of Mechanical Engineering*. F. Kreith, editor. CRC Press, Inc. Boca Raton, FL 33431 (1998).
- II.14. Rabl A and Curtiss PS. 1996. "Impact Analysis for Air and Water Pollution: Methodology and Software Implementation". Chapter 13, p.393-426. *Environmental Modeling - Vol.3*. P. Zannetti, editor (1996)
- II.13. Rabl A. 1994. "Application of Parameter Estimation in Buildings: an Overview". Chapter 4, p.67-89. *System Identification Applied to Building Performance Data*. J.J. Bloem, editor. Institute for Systems Engineering and Informatics, Joint Research Center, European Commission.
- II.12. J. F. Kreider, **A. Rabl**, G. N. Walton and G. K. Yuill. 1993. "Energy Estimation Methods". Chapter 28, p.28.1-28.38, of *ASHRAE Handbook of Fundamentals*, 1993 edition. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Atlanta, GA 30329. (1993)
- II.11. A. Rabl. 1990. "Optical Theory and Modeling of Solar Collectors". Chapter 3, p.56-98, of *Solar Collectors, Energy Storage and Materials*. F. de Winter, editor. MIT Press. Cambridge, MA. 1990.
- II.10. A. Rabl. 1990. "Collector Concepts and Designs". Chapter 2, p.25-55, of *Solar Collectors, Energy Storage and Materials*. F. de Winter, editor. MIT Press. Cambridge, MA. (1990)
- II.9. P. Brejon, D. Marchio and **A. Rabl**, assisted by S. Debergue, R. Faisant and Y. Moch. 1989. *Energy Audit in Existing Buildings: Landmarks - L'Audit énergétique dans les bâtiments existants: points de repère*. 82 p. Monograph publ. by Agence Française pour la Maîtrise de l'Energie, Paris, (1989)
- II.8. J. P. Harris, L. K. Norford, **A. Rabl** and J. Roturier. 1989. "Electronic Office Equipment: The Impact of Market Trends and Technology on End Use Demand". p.427-460 of *Electricity: Efficient End Use and New Generation Technologies, and Their Planning Implications*, edited by T. B. Johansson et al. Lund University Press. (1989)
- A French version, has been published as "Energie et Micro-informatique: une relation ambivalente" in *Bâtiment-Energie*, n° 55, p.48 (1989)
- II.7. J. M. Gordon and A. Rabl. 1986. "Design of Solar Industrial Process Heat Systems". Chapter 6, p.387-418 of *Reviews of Renewable Energy Resources*, Wiley Eastern Limited. New Delhi. (1986)
- II.6. A. Rabl. 1986. "Prediction of annual electricity production by photovoltaic cells". Chapter 5, p.51-66 of *The Handbook of Photovoltaic Applications*, A. F. Williams, editor. Fairmont Press, Atlanta, GA (1986)
- II.5. A. Rabl. 1985. "Concentrating Solar Collectors". *Advances in Solar Energy* 2, 405-481 (1985)
- II.4. F. Kreith and A. Rabl. 1985. "Solar Energy". Chapter 7, p.7.1-7.37, of *Handbook of Heat Transfer Applications*, 2nd edition. McGraw-Hill, New York (1985)
- II.3. F. Kreith, G.O.G. Löf, **A. Rabl** and R. Winston. 1980. "Solar Collectors for Low and Intermediate Temperature Applications". *Progress in Energy and Combustion Science*, 6, 1-34 (1980)
- II.2. A. Rabl. 1980. "Concentrating Collectors". Chapter 10 (pp. 258-343) of *Solar Energy Technology Handbook*. Marcel Dekker Inc., New York (1980)
- II.1. A. Rabl. 1980. "Intermediate Concentration Solar Thermal Collectors". Chapter 8 (pp. 1-43) of *Solar Energy Handbook*. McGraw-Hill, New York (1980)

III. RESEARCH ARTICLES (peer-reviewed journals)

- III.118. Nedellec V, **Rabl A** and W Dab. 2016. “Public health and chronic low chlordecone exposure in Guadeloupe, Part 1: hazards, exposure-response functions, and exposures”, *Environmental Health* (2016). DOI 10.1186/s12940-016-0160-x
- III.117. Nedellec V, **Rabl A** and W Dab. 2016. “Public health and chronic low chlordecone exposure in Guadeloupe, Part 2: Health impacts, and benefits of prevention”, *Environmental Health* (2016). DOI 10.1186/s12940-016-0159-3
- III.116. Nedellec V and **Rabl A**. 2016. “Costs of Health Damage from Atmospheric Emissions of Toxic Metals. Part 1: Methods and Results”, *Risk Analysis*, in press.
- III.115. Nedellec V and **Rabl A**. 2016. “Costs of Health Damage from Atmospheric Emissions of Toxic Metals. Part 2: Analysis for Mercury and Lead”, *Risk Analysis*, in press.
- III.114. Rabl A and Rabl VA. 2013. “External Costs of Nuclear: Greater or Less than the Alternatives?” *Energy Policy*, vol. 57, 575–584.
- III.113. Nedellec V, Lapkoff J, **Rabl A**. 2012. “Hiérarchisation des polluants chimiques émis par les installations de traitement des déchets ménagers en France base sur les impacts sanitaires non cancérogènes”. *Environ Risque Sante – Vol. 11, n8 2, mars-avril 2012*
- III.112. Rabl A, Nazelle A. 2012. “Benefits of Shift from Car to Active Transport”. *Transport Policy*, vol. 19 (1), 121–131
- III.111. **Rabl A**, Thach TQ, Chau PYK and Wong CM. 2011. “How to determine life expectancy change of air pollution mortality: a time series study”. *Environmental Health*, 2011, 10:25 (16 pp.).
- III.110. Nazelle A, Nieuwenhuijsen MJ, Antó JM, Brauer M, Briggs D, Braun-Fahrlander C, Cavill N, Cooper AR, Desqueyroux H, Fruin S, Hoek G, Int Panis L, Janssen N, Jerrett M, Joffe M, Jovanovic Andersen Z, van Kempen E, Kingham S, Kubesch N, Leyden K, Marshall JD, Matamala J, Mellios G, Mendez M, Nassif H, Ogilvie D, Peiró R, Pérez K, **Rabl A**, Ragettli M, Rodríguez D, Rojas D, Ruiz P, Sallis JF, Terwoert J, Toussaint J-F, Tuomisto J, Zurbier M, Erik Lebret E. 2011. “Improving health through policies to promote active travel: a review of evidence to support integrated health impact assessment”. *Environment International*, vol.37, 766–777.
- III.109. B Desaignes, D Ami, A Bartczak, M Braun-Kohlová, S Chilton, M Czajkowski, V Farreras, A Hunt, M Hutchison, C Jeanrenaud, P Kaderjak, V Máca, O Markiewicz, A Markowska, H Metcalf, S Navrud, JS Nielsen, R Ortiz, S Pellegrini, **A Rabl**, P Riera, M Scasny, M-E Stoeckel, R Szántó, J Urban. 2011. “Economic Valuation of Air Pollution Mortality: A 9-Country Contingent Valuation Survey of Value of a Life Year (VOLY)”. *Ecological Indicators*, vol.11 (3), 902–910.
- III.108. van Grinsven HJM, **Rabl A**, de Kok TM. 2010. “Estimation of incidence and social cost of colon cancer due to nitrate in drinking water in the EU: a tentative cost-benefit assessment”. *Environmental Health*, vol. 9:58 (12 p).
- III.107. **Rabl A** and B. van der Zwaan. 2009. “Cost–benefit analysis of climate change dynamics: uncertainties and the value of information”. *Climatic Change*, Volume 96, Number 3 / October, 313-333.
- III.106. J. V. Spadaro and **Rabl A**. 2008. “Global Health Impacts and Costs due to Mercury Emissions”. *Risk Analysis*, Vol.28 (3), June 2008, 603–613.
- III.105. **A. Rabl**, J. V. Spadaro and A. Zoughaib. 2008. “Environmental Impacts and Costs of Municipal Solid Waste: A Comparison of Landfill and Incineration”. *Waste Management & Research*, vol.26, 147-162 (2008).
- III.104. “Estimating the Uncertainty of Damage Costs of Pollution: a Simple Transparent Method and Typical Results”. J. V. Spadaro and **A. Rabl**. *Environmental Impact Assessment Review*, vol. 28 (2008) 166–183.

- III.103. **Rabl A** and Holland M. 2008. "Environmental Assessment Framework for Policy Applications: Life Cycle Assessment, External Costs and Multicriteria Analysis". *Journal of Environmental Planning and Management*, Vol. 51(1), 81 – 105, January 2008.
- III.102. Rabl A. 2007. "Pollution atmosphérique et bâtiments: estimation des coûts de dommage" (Air pollution and buildings: estimation of the damage costs). *Pollution Atmosphérique*, numéro special Oct 2007, 101-110.
- III.101. **Rabl A**, Benoist A, Dron D, Peuportier B, Spadaro JV and Zoughaib A (2007): "How to account for CO2 emissions from biomass in an LCA". *Int J LCA* 12 (5) 281. A French version "Comment prendre en compte les émissions de CO2 provenant de la biomasse dans une analyse de cycle de vie", *Pollution Atmosphérique*, Numéro Spécial *Le Bois Energie*, 221-222, March 2009.
- III.100. B. Desaignes, **A. Rabl**, D. Ami, Boun My Kene, S. Masson, M-A Salomon and L. Santoni. 2007. "Monetary Value of a Life Expectancy Gain due to Reduced Air Pollution: Lessons from a Contingent Valuation". *Revue d'Economie Politique*, Vol.117 (5), 675-698.
- III.99. "Improving Policy Responses to the Risk of Air Pollution". **A.Rabl**, J. Nathwani, M. Pandey, and F. Hurley. *J of Toxicology and Environmental Health, Part A*, 70:3, 316 – 331 (2007).
- III.98. "Analysis of air pollution mortality in terms of life expectancy changes: relation between time series, intervention and cohort studies". A. Rabl. *Environmental Health: A Global Access Science Source* 2006, 5:1 (01 Feb 2006), <http://www.ehjournal.net/content/5/1/1>
- III.97. "Damage Costs of Nitrogen Fertilizer in Europe and Their Internalization". H. von Blottnitz, **A. Rabl**, D. Boiadjev, T. Taylor and S. Arnold. *J. Environmental Planning and Management*, Vol. 49, No. 3, 413 – 433, May 2006.
- III.96. "Analyse coût-bénéfice du contrôle de la pollution : nécessité, méthodologie et Exemples". Rabl A. *Économie et Prévision* n°167(1), p.1-12 (2005).
- III.95. "Air pollution mortality: harvesting and loss of life expectancy". A Rabl. *J Toxicology and Environ Health*, A 68: 1175-80 (2005).
- III.94. "Uncertainty of Air Pollution Cost Estimates: To What Extent does it Matter?". **A Rabl**, JV Spadaro & B van der Zwaan. *Environmental Science & Technology*, vol.39(2), 399-408 (2005).
- III.93. "The learning potential of photovoltaics: implications for energy policy". B van der Zwaan & **A Rabl**, *Energy Policy*, vol.32(13), 1545–1554 (2004).
- III.92. "Pathway Analysis for Population-Total Health Impacts of Toxic Metal Emissions", J V Spadaro & A Rabl. *Risk Analysis*, vol.24(5), 1121-1141 (2004).
- III.91. "Prospects for PV: a learning curve analysis". B van der Zwaan & **A Rabl**, *Solar Energy*, Vol.74(1), 19-31 (2003).
- III.90. "Interpretation of Air Pollution Mortality: Number of Deaths or Years of Life Lost?". A Rabl, *J Air and Waste Management*, Vol.53(1), 41-50 (2003). A shortened French version has been published as "Mortalité due à la pollution de l'air: comment interpréter les resultants", *Pollution Atmosphérique*, vol.180, 541-550 (2003).
- III.89. "Health and Environmental Impacts of Energy Systems". **A Rabl** & M Dreicer. *International Journal of Global Energy Issues*, vol.18(2/3/4), 113-150 (2002).
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Organization of workshop on external costs of nitrogen fertilizer, European Commission, Brussels, 13 Oct. 2004.

“Estimating the Health Impacts of Air Pollution: Issues in Attributing Health Effects to Specific Substances and Sources”, Symposium at the 16th Conference of the ISEE, 1-4 August 2004, New York City, co-chaired by A. Rabl (with B. Ostro), and paper (with F. Hurley) “Information Needs Of Policy Makers: Which Pollutant Causes How Much Health Damage?”

“Tools and Strategies for Improving Policy Responses to the Risk of Air Pollution”. AIRNET/NERAM International Colloquium. Rome, 5-7 Nov. 2003. **(Invited lecture)**.

“Air Pollution Mortality: Harvesting and Loss of Life Expectancy”. NERAM 2nd International Colloquium. Baltimore, 21-22 Nov. 2002. **(Invited discussion)**.

“The ExternE Project: Methodology, objectives and limitations”. OECD. Paris, 15 Nov. 2001. **(Invited lecture)**.

“ExternE – the Methodology”. EURELECTRIC (Union of the Electricity Industry). Paris, 26 Jan. 2001. **(Invited lecture)**.

“Les coûts et les bénéfices d’une réduction des émissions”. Les Entretiens de l’Environnement. Pau, 6-9 March 2001. **(Invited lecture)**.

“Mortality due to Air Pollution: How to Interpret the Results”. Environmental Health Risk 2001, Cardiff, RU, 10-12 Sept. **(Invited lecture)**.

SFEN 2000 (Société Française d’Energie Nucléaire) Strasbourg, 27-29 Nov. 2000. **(Invited lecture)**.

Allergy and Automotive Air Pollution, Paris, 12 Jan. 2000. **(Invited lecture)**.

AIR POLLUTION 99, Palo Alto, California, USA, 27 - 29 July 1999 (J. V. Spadaro and A. Rabl. "Estimation of health damage due to emission of air pollutants by cars: the canyon effect", Proceedings p. 457, and A. Rabl. "Uncertainty about components of PM10 and their toxicities and its effect on estimation of health damage", Proceedings p. 467).

SETAC (Society of Environmental Toxicology and Chemistry) Annual Meeting, Bordeaux, April 14-18, 1998. **(Invited lecture)**.

IAEA (International Atomic Energy Agency). Chairman of Technical Committee Meeting "Comparing Risks from Energy Systems in the Far Future", 6 - 10 Oct. 1997.

RISK97, Amsterdam, 21-24 Oct. 1997. RIVM National Institute for Public Health and the Environment, The Netherlands. (Rabl A. "Quantifying the Benefits of Air Pollution Control: the Interpretation of Exposure-Response Functions for Mortality". Proceedings pp.89-96).

4th International Colloquium on Transport and Air Pollution, Avignon, 8-13 June 1997. (Spadaro JV, A Rabl, E Jourdain and P Coussy 1997. "Coûts Externes de la Pollution de l’Air: Étude de Cas et Résultats pour le Trajet Paris-Lyon").

SPIE Conference 3139, Nonimaging Optics. San Diego, California. 27-28 July 1997. (Gordon JM and A Rabl. "Fundamental bounds for attaining uniform far-field irradiance in illumination systems". Proceedings of SPIE, vol.3139).

World Renewable Energy Congress-IV, Denver, CO, 15-21 June 1996 (1 paper)

Society of Risk Analysis Europe, U of Surrey 3-5 June 1996 (2 papers)

SETAC (Society of Environmental Toxicology and Chemistry) Meeting, Taormina, Sicily, 19-22 May 1996 (1 paper).

SPIE (Society of Photo-Optical Instrumentation Engineers) 1996 International Symposium. Denver, CO, 5 - 9 August 1996 (1 paper)

SPIE (Society of Photo-Optical Instrumentation Engineers) 1995 International Symposium. San Diego, CA, 10 - 11 July 1995 (3 papers)

Workshop Les Coûts Externes de l'Energie (The External Costs of Energy), Paris, 20 June 1995. Co-organized with J. Lochard.

Proceedings of the 1995 ASME International Solar Energy Conference), March 1995, pp. 317-324 (1 paper)

Illumination Engineering Society, Annual Meeting. Miami, Florida, 8 - 11 August 1994 (2 papers)

IEA - Future Building Forum Workshop "Efficient Use of Electricity", Sophia Antipolis, France, 18 - 20 May 1994 (1 paper)

SPIE (Society of Photo-Optical Instrumentation Engineers) 1993 International Symposium. San Diego, CA, 12 - 13 July 1993 (1 paper)

Les Entretiens de la Technologie. 11 mai 1993, Nantes. (1 paper)

Société française des thermiciens, EDF les Renardières, France, 9 Dec. 1992. (1 paper)

Sde Boker Symposium on Nonimaging Optics. Institute for Desert Research, Ben Gurion University, Israel. 1 - 6 March 1992. (2 papers)

Société française des thermiciens, Sophia-Antipolis, France, 20-21 May 1992 (**Invited lecture**)

Solar World Congress, Denver, CO, 19-23 Aug. 1991 (1 paper)

SPIE (Society of Photo-Optical Instrumentation Engineers) 1991 International Symposium. San Diego, CA, 22 - 26 July 1991 (2 papers)

American Council on Energy Efficient Economy. 1990 Summer Study. Asilomar, CA. 26 Aug. - 1 Sept. 1990 (1 paper)

Workshop Maîtrise des Usages Spécifiques de l'Electricité dans l'Habitat et le Tertiaire. Agence Française pour la Maîtrise de l'Energie. 12 - 13 June 1988, Sophia Antipolis, France (1 paper)

Workshop on Passive Cooling. Joint Research Center, Ispra, Italy. 2 - 4 April 1990 (1 paper)

American Council on Energy Efficient Economy. 1988 Summer Study. Asilomar, CA. 28 Aug. - 2 Sept. 1988 (2 papers)

Energy Audit in Existing Buildings. Agence Française pour la Maîtrise de l'Energie. 20 - 21 June 1988, Sophia Antipolis, France (1 paper)

International Congress on Building Energy Management 87. Lausanne, 28 Sept. - 2 Oct. 1987 (1 paper)

2nd Sde Boker Workshop on Solar Electricity Production, Israel, 25 - 26 Feb. 1987 (**Invited lecture**)

Workshop on Energy Use in Commercial Buildings, CEES, Princeton University, 7 July 1987. Co-organized with L. K. Norford.

American Council on Energy Efficient Economy. 1986 Summer Study. Santa Cruz, CA. 18 - 22 Aug. 1986 (2 papers)

ASHRAE/DOE/BTECC conference on Thermal Performance of the Exterior Envelopes of Buildings, Clearwater Beach, FL, 2-5 Dec. 1985 (1 paper)

American Council on Energy Efficient Economy. 1984 Summer Study. Santa Cruz, CA. Aug. 1984 (3 papers)

International District Heating Association. 75th Annual Conference. Bretton Woods, NH. 17-20 June 1984 (1 paper)

International Solar Energy Society, Solar World Congress, Perth, Australia, Aug. 1983 (1 paper)

6th World Congress of Engineers and Architects in Israel: Development of the Desert and Sparsely Populated Areas, Tel-Aviv, Israel, Dec. 1983 (1 paper)

First US-China Conference on Energy, Resources and Environment. Peking, China. Nov. 1982 (2 papers)

American Council on Energy Efficient Economy. 1982 Summer Study. Santa Cruz, CA. Aug. 1982 (1 paper)

International Solar Energy Society, Solar World Congress, Brighton, England, Aug. 1981 (2 papers)

Solar Thermal Test Facilities Users Association. Albuquerque, NM. Jan. 1981 (1 paper)

U.S.-Argentinian Solar Energy Workshop, Buenos Aires. Oct. 1979 (**Invited lecture**)

International Solar Energy Society, Atlanta, GA. May 1979 (9 papers)

International Solar Energy Society, U.S. Section, Denver, CO. Aug. 1978. (2 papers)

U.S. DOE Conference on System Simulation and Economic Analysis for Solar Heating and Cooling. San Diego, CA. June 1978 (1 paper)

Symposium on Concentrating Collectors, Denver, CO. June 1978 (**Invited lecture**)

Symposium on Energy from the Sun, Institute of Gas Technology, Chicago, IL. Apr. 1978 (**Invited lecture**)

International Solar Energy Society, New Delhi, India. Jan. 1978 (4 papers)

German Solar Energy Society - Deutsches Sonnenforum, Hamburg, Sep. 1977 (2 papers)

International Solar Energy Society, U.S. Section, Orlando, FL. June 1977 (1 paper)

American Society of Mechanical Engineers, New York, Dec. 1976 (1 paper)

U.S. Section of International Solar Energy Society, Winnipeg, Canada, Aug. 1976 (5 papers)

International Solar Energy Society, Los Angeles, CA. Aug. 1975 (2 papers)

U.S. Section of International Solar Energy Society, Fort Collins, CO. Aug. 1974 (2 papers)