List of references

- Abbas, H., Nasr, R. and Seif, H. (2006). Study for Waste Stabilization pond Geometry for the Wastewater Treatment Efficiency. *Journal of Ecological Engineering* (in press).
- Abis, K. (2002). The Performance of Facultative Waste stabilization ponds in the United Kingdom. PhD Thesis, Civil Engineering, University of Leeds, UK, Leeds.
- Abis, K. and Mara, D.D. (2006). Temperature measurement and stratification in facultative waste stabilization ponds in the UK climate. *Environmental Monitoring and Assessment*, **114**, 35-47.
- Agunwamba, J.C., Egbuniwe, N. and Ademiluyi, J.O. (1992). Prediction of the dispersion number in waste stabilization ponds. *Water Research*, **26** (1), 85-89.
- American Public Health Association (1998). *Standard Methods for the Examination* of Water and Wastewater, 20th ed, American Public Health Association, Washington DC.
- Arceivala, S.T. (1983). Hydraulic modelling for waste stabilization ponds iscussion. *Journal of Environmental Engineering Division*, ASCE, **109** (EE1), 265-268.
- Arceivala, S.T. (1981). Wastewater Treatment and Disposal: Engineering and Ecologyin Pollution Control, Marcel Dekker, New York.
- Arthur, J.P. (1983). Notes on the Design and Operation of Waste stabilization ponds in Warm Climates of Developing Countries. Technical Paper No.7.
 Washington, DC: The World Bank.
- Baléo, J-N., Humeau P. and le Cloirec, P. (1991). Numerical and experimental studies of a lagoon pilot. *Water Research*, **35** (9), 2268-2276.

- Banda, C.G., Sleigh, P.A. and Mara, D.D. (2005). *Escherichia coli* removal in waste stabilization ponds: a comparison of modern and classical designs. *Water Science and Technology*, **51** (12), 75-81.
- Banda, C.G., Sleigh, P.A. and Mara, D.D. (2006a). 3D-CFD modelling of *E.coli* removal in baffled primary facultative ponds: classical design optimization. *Proceedings of the 7th International Water Association (IWA) Specialist Group Conference on Waste Stabilization Ponds*, Asian Institute of Technology Bangkok, Thailand.
- Banda, C.G., Sleigh, P.A. and Mara, D.D. (2006b). CFD-based design of
 Waste Stabilization Ponds: Significance of wind velocity.
 Proceedings of the 7th International Water Association (IWA)
 Specialist Group Conference on Waste Stabilization Ponds, Asian
 Institute of Technology Bangkok, Thailand.
- Benelmouffok, D.E. and Yu, S.L. (1989). Two dimensional numerical modelling of hydrodynamics and pollutant transport in a wet detention pond. *Water Science and Technology*, **21** (5) 727-738.
- Buchauer, K. (2006). Comparison of model approaches for predicting coliform removal in waste stabilization ponds. *Water and Environmental Journal*
- Bokil, S.D. and Agrawal, G.D. (1977). Stratification in laboratory simulations of shallow waste stabilization ponds. *Water Research*, **11**, 1025-1030.
- Brissaud, F., Lazarova, V., Ducoup, C., Joseph, C. and Tournoud, M. (2000).
 Hydrodynamic behaviour and faecal coliform removal in a maturation pond. *Water Science and Technology* 42 (10/11), 119-126.
- Brissaud, F., Tournoud, M. G. Drakides, C., and Lazarova, V. (2003). Mixing and its impact on faecal coliform removal in a stabilization pond. *Water Science* and Technology 48 (2), 75-80.

- Carmago, V.M. (2007). University of Leeds, School of Civil Engineering. Personal communication.
- Chick, H. (1908). An investigation of the Laws of Disinfection, *Journal of Hygiene*, **8**, 92-158.
- Council of the European Communities (1991). Council Directive 91/271/EEC Concerning Urban Wastewater Treatment, *Official Journal of the European Communities*, L135, 40-52.
- Curtis, T.P. (1990). Mechanisms of Removal of Faecal Coliforms from Facultative Waste stabilization ponds in the United Kingdom. PhD Thesis, Civil Engineering, University of Leeds, UK, Leeds.
- Curtis, T.P. and Mara, D.D. (1994). The Effect of Sunlight on Mechanisms for the Die-off of Faecal Coliform Bacteria in Waste stabilization ponds. TPHE Research Monograph No.1. Leeds, England: University of Leeds, Department of Civil Engineering.
- Curtis, T.P., Mara, D.D. and Silva, S.A. (1992). The Effect of Sunlight on faecal coliforms in ponds: implications for research and design. *Water Science and Technology*, **26** (7/8) 1729-1738.
- Feachem, R., Bradley, D., Garelick, H. and Mara, D.D. (1983). Sanitation and Disease: Health Aspects of Excreta and Wastewater Management. John Wiley & Sons, Chichester.
- Ferziger, J.H. and Peric, M. (2002). *Computational Methods for Fluid Dynamics*, 3rd ed. Springer- Verlag, Berlin Heidelberg.
- FLUENT User's Manual Version 6.1. (2003). Fluent Inc. Centerra Resource Park, Lebanon, USA.

- Frederick, G. L. and Lloyd, B. J. (1996). An evaluation of retention time and shortcircuiting in waste stabilization ponds using *Serratia marcescens* bacteriophage as a tracer. *Water Science and Technology* **48** (2), 173-180.
- Fritz, J.J., Meredith, D.D. and Middleton, A.C. (1980). Non-steady state bulk temperature determination for stabilization ponds. *Water Research*, **14** 413-420.
- Gawasiri, C.B. (2003). Modern Design of Waste Stabilization Ponds in Warm Climates: Comparison with Traditional Design Methods. MSc Thesis, Civil Engineering, University of Leeds, UK, Leeds.
- Gu, R. and Stefan, H.G. (1995). Stratification dynamics in waste stabilization ponds.*Water Science and Technology*, **29** (8) 1909-1923.
- Horan, N.J. (1990). *Biological Wastewater Treatment Systems: Theory and Operational*, John Wiley & Sons, Chichester, ISBN 0471922587
- Johnson, M. and Mara, D.D. (2002). Research on Waste Stabilization Ponds in the United Kingdom-II. Initial Results from Pilot-scale Maturation Ponds, Reedbed Channel and Rock Filters. In *Pond Technology for the New Millennium*, pp 11-18, New Zealand Water and Wastes Association, Auckland.
- Kayombo, S., Mbwette, T.S.A., Mayo, A.W. and Katima, J.H.Y. (2000). Modelling diurnal variation of dissolved oxygen in waste stabilization ponds. *Ecological Modelling*, **127**, 21-31.
- Kellner, E. and Pires, E.C. (2002). The influence of thermal stratification on the hydraulic behaviour of waste stabilization ponds. *Water Science and Technology*, **45** (1) 41-48.
- Kilan, J.S. and Ogunrombi, J.A. (1984). Effects of baffles on the performance of model waste stabilization ponds. *Water Research*, **18** (8) 941-944.

- Klock, J.W. (1971. Survival of Coliform Bacteria in Wastewater Treatment Lagoons. *Journal of the Water Pollution Control Federation*, **43** (14), 2071-2083.
- Launder, B.E. and Spalding, D.B. (1974). The Numerical Computation of Turbulent Flows. *Comput. Methods Appl.*. *Mech. Eng.*, **3**, 269-289.
- Levenspiel, O. (1972). *Chemical Reaction Engineering*, 2nd ed. John Wiley & Sons, New York.
- Lloyd, B.J., Vorkas, C.A., and Guganesharajah, R.K. (2003). Reducing Hydraulic Short Circuiting in Maturation Ponds to Maximize Pathogen Removal Using Channels and Wind Breaks. *Water Science and Technology*, **48** (2) 153-162.
- McGarry, M.G and Pescod, W.B. (1970). Stabilization pond design criteria for tropical Asia. In *Proceedings of the second International Symposium on Waste Treatment Lagoons* (ed. R.E. McKinney), pp. 114-132. Laurence, KS: University of Kansas.
- Mangelson, K. and Watters, G. (1972). Treatment efficiency of waste stabilization ponds. *Journal of the Sanitary Engineering Division*, ASCE, (**SA2**), 407-425.
- Mara, D.D. (1976). *Sewage Treatment in Hot Climates*. Chichester, England: John Wiley and Sons.
- Mara, D.D. (1987). Waste stabilization ponds: problems and controversies. *Water Quality International*, (1), 20-22.
- Mara, D.D. (1997). Design Manual for Waste stabilization ponds in India. Lagoon Technology International Ltd., Leeds, England.
- Mara, D.D. (2004). *Domestic Wastewater Treatment in Developing Countries*. Earthscan Publications, London, England, ISBN 1844070190

- Mara, D.D. and Pearson, H.W. (1986). Artificial freshwater environments: waste Stabilization ponds. In *Biotechnology*, vol. 8 (ed. W. Schoenborn), pp. 177-206. VCH Verlagsgesellschaft: Weinheim.
- Mara, D.D., Alabaster, G.P., Pearson, H.W. and Mills. (1992). Waste stabilization ponds: Design Manual eastern Africa. Lagoon Technology International Ltd. Leeds.
- Mara, D.D. and Mills, S.W. (1994). Who's afraid of anaerobic ponds? *Water QualityInternational*, (**2**), 34-36.
- Mara, D.D. and Pearson, H.W. (1998). *Waste stabilization ponds: Design Manual for Mediterranean Europe*. Lagoon Technology International Ltd. Leeds.
- Mara,D.D.,Pearson, H.W.,Oragui,J.I.,Arridge,A. and Silva, S.A.(2001).
 Development of a New Approach to Waste Stabilization Pond Design, Tropical
 Public Health Engineering Research Monograph No.12, School of Civil
 Engineering, University of Leeds.
- Marais, G.V.R. (1974). Faecal bacterial kinetics in waste stabilization ponds.
 Journal of the Environmental Engineering Division, ASCE, **100** (EE1), 119-139.
- Marais, G.V.R and Shaw, V.A. (1961). A Rational Theory for the Design of Sewage Stabilization Ponds in Central and South Africa, *Transactions, South African Institute of Civil Engineers*, **3** 205-227.
- Marecos do Monte, M.H.F and Mara, D.D. (1987). The hydraulic performance of waste Stabilization ponds in Portugal. *Water Science and Technology*, **19** (12), 219-227.
- Mayo, A.W. (1989). Effect of pond depth on bacterial mortality rate in waste stabilization ponds. *Journal of Environmental Engineering Division*. ASCE, 115 (5), 964-977.

- Mayo, A.W. (1995). Modelling coliform mortality in waste stabilization ponds.*Journal of Environmental Engineering Division*. ASCE, **121** (2), 140-152.
- Meiring, P.G., Drews, R.J., van Eck, H. and Stander, G.J. (1968). A Guide to the Use of Pond Systems in South Africa for the Purification of Raw and Partially Treated Sewage. CSIR Special Report WAT 34. Pretoria, South Africa: National Institute for Water Research.
- Mills, S.W., Alabaster, G.P., Mara, D.D., Pearson, H.W. and Thitai, W.N.(1992). Efficiency of Faecal Bacterial Removal in Waste Stabilization Ponds in Kenya, *Water Science Technology*, **26** (7-8), 1739-1748.
- Moshe, M., Betzer, N. and Kott, Y. (1972). Effect of Industrial Wastes on Oxidation Pond Performance. *Water Research*, **5** (10), 1165-1171.
- Muttamara, S. and Puetpaiboon, J. (1996). Nitrogen removal in baffled waste stabilization ponds. *Water Science and Technology*, **33** (7) 173-181.
- Muttamara, S. and Puetpaiboon, J. (1997). Roles of baffles in waste stabilization ponds. *Water Science and Technology*, **35** (7) 275-284.
- Nameche, T. and Vasel, J. (1998). Hydrodynamics studies and modelization for aerated lagoons and waste stabilization ponds. *Water Research*, **32** (10), 3039-3045.
- Olsen, N.R.B. and Tjomsland, T. (1998). 3D CFD modelling of wind induced currents and dispersion of radioactive tracer in a lake. Presented at: *3* ^{*rd*} *International Conference on Hybroscience and Engineering*, 31st August 3 rd September, Cottbus, Germany.
- Patankar, S.V. (1980). Numerical Heat Transfer and Fluid Flow. HemispherePublishing Corporation, Taylor & Francis Group, New York.

- Pano, A. and Middlebrooks, E.J. (1982). Ammonia Nitrogen Removal in Facultative
 Waste Stabilization Ponds. *Journal of the Water Pollution Control Federation*, 54 (4), 344-351.
- Parhad, N.M. and Rao, N.U. (1974). Effect of pH on survival of Escherichia coli. Journal of the Water Pollution Control Federation, 46 (5), 980-986.
- Pearson, H.W., Mara, D.D. and Arridge, H.A. (1995). The Influence of pond geometry and configuration on facultative and maturation waste stabilization pond performance and efficiency. *Water Science and Technology*, **31** (12), 129-139.
- Pearson, H.W., Mara, D.D., Cawlley, L.R., Arridge, H.A. and Silva, S.A. (1996).
 Performance of an innovative tropical experimental waste stabilization pond system operating at high loadings. *Water Science and Technology*, **33** (7), 63-73.
- Pearson, H.W. (1987). Estimation of Chlorophyll a as a Measure of Algal Biomass in Waste Stabilization Ponds, in *Seminario Regional de Investigación sobre Lagunas de Establizació*, pp.158-170, CEPIS, Lima.
- Pearson, H.W., Mara, D.D., Konig, A., De Oliveira., and Silva, S.A. (1987a). Water column sampling as a rapid and efficient method of determining effluent quality and performance of waste stabilization ponds. *Water Science and Technology*, **19** (12), 100-119.
- Pearson, H.W., Mara, D.D., Mills. S.W. and Smallman, D.J. (1987b). Factors determining algal populations in waste stabilization ponds and the influence of algae on pond performance. *Water Science and Technology*, **19** (12), 131-140.
- Pearson, H.W., Mara, D.D., Mills. S.W. and Smallman, D.J. (1987c).
 Physiochemical parameters influencing faecal bacterial survival in waste stabilization ponds. *Water Science and Technology*, **19** (12), 145-152.

- Pedahzur, R., Nasser, A.M., Dor, I., Fattal, B., and Shuval, H.I. (1993). The effect of baffle installation on the performance of a single-cell stabilization pond. *Water Science and Technology*. 27 (7-8) 45-52.
- Perry, R.H. and Green, D.W. (1984). *Perry's Chemical Engineer's Handbook*, 6th Edn. McGraw-Hill, New York.
- Persson, J. (2000). The Hydraulic Perfomance of Ponds of Various Layouts, *Urban Water*, **2**, 243-242
- Pena, M.R., Mara, D.D. and Piguet, J.M. (2002). Improvement of mixing patterns in pilot-scale anaerobic ponds treating domestic sewage. *Water Science and Technology*, **48** (2), 235-242.
- Pena, M.R., Mara, D.D. and Sanchez, A. (2000). Dispersion studies in anaerobic ponds: implications for design and operation. *Water Science and Technology*, 42 (10-11), 273-282.
- Polprasert, C., Dissanayake, M.G., and Thanh, N.C. (1983). Bacterial Die-Off Kinetics in Waste stabilization ponds. *Journal of the Water Pollution Control Federation*, 55 (3), 285-296.
- Polprasert, C.and Bhattarai, K.K. (1985). Dispersion Model for Waste stabilization ponds. *Journal of Environmental Engineering Division*, ASCE, **111** (1), 45-59.
- Qin, D., Bliss, P.J., Barnes, D. and Fitzgerald, P.A. (1991). Bacterial (total coliform) die-off in maturation ponds. *Water Science and Technology*, **23** (7-9), 1525-1534.
- Reed, S.C., Middlebrooks, E.J. and Crites, R.W. (1988). *Natural Systems for Waste Management & Treatment*. McGraw-Hill, Inc. New York.

- Reed, S.C. (1985). Nitrogen Removal in Waste Stabilization Ponds. *Journal of the Water Pollution Control Federation*, 57 (1), 39-45.
- Salter, H. (1999). Enhancing the Pathogen Removal Performance of Tertiary Lagoons. PhD Thesis, Centre for Environmental Health Engineering, University of Surrey; Guildford, England.
- Saqqar, M.M. and Pescod, M.B. (1992). Modelling coliform reduction in waste stabilization ponds. *Water Science and Technology*, **26** (7-8) 1667-1677.
- Silva, S.A. (1982). On the Treatment of Domestic Sewage in Waste stabilization ponds in Northeast Brazil.. PhD Thesis, University of Dundee, Dundee, UK.
- Shilton, A.N. (2001). *Studies into the Hydraulics of Waste Stabilization Ponds*. PhD Thesis, Massey University, Palmerston North.
- Shilton, A. and Harrison, J. (2003a). Integration of coliform decay within a CFD (Computational fluid dynamic) model of a waste stabilisation pond. *Water Science and Technology*, **48** (2) 205-210.
- Shilton, A. and Harrison, J. (2003b). *Guidelines for the Hydraulic Design of Waste* Stabilization ponds. Institute of Technology and Engineering, Massey University. Palmerston North.
- Shilton, A.N and Mara, D.D. (2005). CFD (computational fluid dynamics)
 modelling of baffles for optimizing tropical waste stabilization ponds system.
 Water Science and Technology 51 (12) 103-106
- Skerry, G.P. and Parker, C.D. (1979). Development of an Improved Quantitative Relationship between Bacterial Die-off, Design and Operational Factors for Anaerobic –Aerobic and Maturation Type Lagoon System. *Progress in Water Technology*, **11**(4-5), 427-443.

Sleigh, P.A. and Mara, D.D. (2003). Monte Carlo Program for Facultative pond Design, available at <u>http://www.efm.leeds.ac.uk/CIVE/Mcarlo/index.html</u>.

SPSS for Windows. (2007). SPSS Inc. Headquarters, Chicago, USA.

- Sweeney, D. (2004). Integrating Biological and Hydraulic aspects of Waste Stabilization Ponds. PhD Thesis, Department of Environmental Health, School of Medicine, Flinders University, Adelaide, Australia.
- Tchobanoglous, G., Burton, F. and Sense, H.D. (2003). Wastewater Engineering: Treatment and Reuse: Metcalf & Eddy, Inc-4th ed. McGraw-Hill Company, New York.
- Thackston, E.L., Shields, F. D. Jr. and Schroeder, P.R. (1987). Residence time distributions of shallow basins. *Journal of Environmental Engineering*, 113, (6), 1319-1332.
- Thirumurthi, D. (1969). Design principles of waste stabilization ponds. *Journal of the Sanitary Engineering Division*, ASCE, **95** (SA2), 311-330.
- Thirumurthi, D. (1974). Design criteria for waste stabilization ponds. *Journal of the Water Pollution Control Federation*, **46** (9), 2094-2106.
- Van Dorn, W. (1953). Wind stress on an artificial pond. Journal of Marine Research, **12**(3), 249-276
- Vega, G.P., Pena, M.R. Ramirez, C. and Mara, D.D. (2003). Application of CFD modelling to study the hydrodynamics of various anaerobic pond configurations. *Water Science and Technology*, **48** (2), 163-171.
- Versteeg, H.K. and Malalasekera, W. (1995). *An introduction to computational fluid dynamics – the finite volume method*. Pearson Education Ltd, Harlow

- von Sperling, M. (1996). Design of facultative pond based on uncertainty analysis. *Water Science and Technology*, **33** (7), 41-47.
- von Sperling, M. (1999). Performance Evaluation and Mathematical Modelling of Coliform Die-off in Tropical and Subtropical Waste stabilization ponds. *Water Science and Technology*, **33** (6), 1435-1448.
- von Sperling, M. (2002). Influence of the dispersion number on the estimation of coliform removal in ponds. In *Pond Technology for the New Millennium*, pp. 283-289, New Zealand Water and Wastes Association, Auckland.
- von Sperling, M., Chernicharo, C.A.L., Soares, A.M.E. and Zerbini, A.M. (2002).
 Coliform and helminth eggs removal in a combined UASB reactor baffled pond system in Brazil: performance evaluation and mathematical modelling.
 Water Science and Technology 45 (10), 237-242.
- Vorkas, C. A. and Lloyd, B. J. (2000). The application of a diagnostic for the identification of hydraulic design deficiencies affecting pathogen removal. *Water Science and Technology* 42 (10/11), 99-109.
- Wehner, J.F. and Wilhelm, R.H. (1956). Boundary Conditions of Flow Reactor. *Chemical Engineering Science*, 6, 89-93
- WHO (2000). Global Water Supply and Sanitation Assessment Report.World Health Organization, Geneva.
- WHO (2003). Guidelines for Drinking Water Quality: Volume 1 Recommendations.World Health Organization, Geneva.
- WHO (2006). *Health Guidelines for the use of Wastewater in Agriculture*.World Health Organization, Geneva.

- Wood, M. (1997). Development of Computational Fluid Dynamics Models for the Design of Waste Stabilization Ponds. PhD Thesis, Department of Chemical Engineering, University of Queensland; Brisbane, Australia.
- Wood, M., Greenfield, P.F., Howes, T., Johns, M.R., and Keller, J. (1995).
 Computational Fluid Dynamic Modelling of Waste Stabilization Ponds. *Water Science Technology*, **31** (12), 111-118.
- Wood, M., Howes, T., Keller, J., and Johns, M. (1998). Two-dimensional computational fluid dynamic models for waste stabilization ponds. *Water Research*, **32** (3), 958-963.
- Yanez, F. (1993). Lagunas de estabilizacion. Teoria, diseño y mantenimiento,Ministerio de Salud Pública, Quito.
- Zanotelli, C.T., Medri, W., Belli Filho, P., Perdomo, C.C and Costa, R.H.R. (2002). Performance of a baffled facultative pond treating piggery wastes. *Water Science and Technology*, **45** (1) 49-53