

Basics of Water Resources

Pieter van der Zaag, UNESCO-IHE Delft & University of Zimbabwe

Table of Contents

1. Concepts and definitions	1
1.1 The water cycle 1	
1.2 Three characteristics of water	6
1.3 Integrated water resources management	6
1.4 Policy principles	8
1.5 Sustainability of water resources	9
1.6 Institutional aspects	11
1.7 Strategic issues	13
1.8 Exercises	15
1.9 References	16
2. Water resources	17
2.1 The water balance	17
2.2 Groundwater resources	21
2.3 Surface water	25
2.4 Catchment yield	26
2.5 The rainbow of water revisited	29
2.6 The water balance as a result of human interference	31
2.7 References	33
3. Water allocation principles	34
3.1 Introduction	34
3.2 Balancing demand and supply	34
3.3 Issues in water allocation	39
3.4 Conclusions	44
3.5 Exercise	45
3.6 References	46
4. Urban water demand	47
4.1 Estimation of urban water demand	47
4.2 Pricing of urban water	54
4.3 Exercises	66
4.4 References	68
5. Agricultural water demand	70
5.1 Yield response to water	70
5.2 Crop water requirements	72
5.3 Yield reduction due to water shortage	79
5.4 Exercises	81
5.5 References	83
6. Environmental water requirements	84
6.1 Introduction	84
6.2 Quantifying environmental water requirements	86
6.3 References	94