

TABLE OF CONTENTS

OVERVIEW OF ABBREVIATIONS.....	1
INTRODUCTION	1
1 HUMAN POPULATION AND ENVIRONMENT	3
1.1 Man and Environment.....	3
1.2 Environment	4
1.3 Ecology.....	7
1.4 Ecosystem	9
1.5 Environmentalistics	17
1.6 Engineering and Environment	21
1.6.1 Framing Environmental Issues.....	21
1.6.2 The Role of Engineering.....	25
1.6.3 Approaches to “Green” Engineering	26
1.6.3.1. Sources of Environmental Impacts	27
1.6.3.2. A Life Cycle Perspective	28
1.6.3.3. Industrial Ecology and Sustainable Development	29
2 ABIOTIC AND BIOTIC ENVIRONMENTAL FACTORS.....	31
2.1 Abiotic Environmental Factors	31
2.1.1 Physical Environmental Factors.....	31
2.1.2 Chemical Environmental Factors.....	32
2.2 Biotic Environmental Factors.....	33
2.3 Time	35
2.4 Ecological Valence and Tolerance	36
3 SOURCE OF ENERGY AND OF THE NATURE	38
3.1 Energy	38
3.2 Mass.....	39
3.3 Cycle in the Nature	39
3.3.1 The Rock Cycle.....	40
3.3.2 The Cycle of Water (H ₂ O).....	41
3.3.3 The Carbon Cycle (C).....	42
3.3.4 The Cycle of Oxygen (O ₂)	45

3.3.5	The Cycle of Nitrogen (N ₂)	48
3.3.6	The Cycle of Sulfur (S)	49
3.3.7	The Cycle of Phosphorus (P)	50
3.3.8	The Cycle of Other Elements	51
4	GEOSYSTEMS OF EARTH	53
4.1	Geosphere	53
4.1.1	Lithosphere	55
4.1.1.1.	Pedosphere	56
4.1.1.2.	Hydrosphere.....	57
4.1.2	Atmosphere	60
4.2	Biosphere	62
4.2.1	Phytosphere	63
4.2.2	Zoosphere	65
4.2.3	Micro-organ sphere	66
4.3	Anthroposphere	67
4.3.1	Human Society	68
4.3.2	Human Work (artifacts)	68
5	NATURAL RESOURCES AND THEIR ACQUISITION	69
5.1	Classification of Natural Resources.....	69
5.2	Food and Agriculture	72
5.3	Wood and Other Renewable Resources from Living Nature.....	76
5.4	Minerals and Rocks, their Extraction	80
5.4.1	Ore	83
5.4.2	Non-ore Raw Materials.....	84
5.4.3	Fossil Fuels	84
5.5	Extraction and Processing of Critical Raw Materials for the European Union	89
5.6	Energy Resources, Fossil Energy	99
5.6.1	Energy	100
5.7	Renewable and Inexhaustible Energy Sources	103
5.7.1	Solar Radiation.....	104

5.7.2	Energy of the Seas and Oceans.....	111
5.7.2.1.	Wave Energy	111
5.7.2.2.	Sea Tides Energy	112
5.7.2.3.	Coastal Currents.....	114
5.7.2.4.	Energy of Ocean Temperature Gradients.....	115
5.7.3	Geothermal Energy.....	115
5.7.4	Wind Power	122
5.7.5	Biomass.....	128
5.8	The Future of Natural Resources.....	135
5.9	Nature’s Potential and Stress	137
5.9.1	Ways of Using Nature	137
5.9.2	Limits of Usefulness	138
5.9.3	Integration of Economics and Ecology	138
5.10	Ecological conditions	139
5.10.1	Ecological Stability	140
5.10.2	Ecological Stress	141
6	BASIC COMPONENTS OF THE ENVIRONMENT - WATER.....	143
6.1	Functions of Water in Nature	143
6.2	Sensory Properties of Water	146
6.3	Distribution of Water.....	146
6.4	Water Pollution.....	147
6.4.1	Groundwater Pollution.....	148
6.4.2	Pollution of Surface Water	150
6.4.2.1.	The nature and Characteristics of Pollutants.....	150
6.4.2.2.	Quality of Surface Water and the Method for Their	153
6.5	Biochemical Processes Waters - Self-cleaning Biochemical Process.....	155
6.6	Waste Water Treatment.....	156
6.6.1	Mechanical Processes.....	157
6.6.2	Physico-chemical and Chemical Processes.....	157
6.6.3	Biological Processes.....	158

6.7	Protection of Water Ratio and Water Resources in Slovakia	160
6.8	Knowledge and Information on Eutrophicated Eater Revitalization	161
6.8.1	Eutrophication	161
6.8.1.1.	Causes of Eutrophication	162
6.8.1.2.	Consequences of Eutrophication	163
6.8.1.3.	Negative Impacts of Massive Water Bloom Development on the Ecosystem	163
6.8.1.4.	Monitoring Eutrophication.....	164
6.8.1.5.	Measures to Reduce Phosphorus and Nitrogen	165
6.9	Knowledge and Information on Eutrophicated Eater Revitalization	165
6.9.1	Terminology, Basic Concepts	166
6.9.2	Evolution of Cyanobacteria.....	168
6.9.3	Ecology of Cyanobacteria.....	168
6.9.4	Construction of the Cell	168
6.9.5	Morphology and Cytology.....	169
6.9.6	Reproduction	171
6.9.7	Systematic Breakdown.....	172
6.9.8	Substances Produced by Cyanobacteria	175
6.9.8.1.	Cyanotoxins.....	175
6.9.8.2.	Health Problems Caused by Cyanobacteria	179
6.9.8.3.	Influence of chemical and physical factors on cyanobacterial development and cyanotoxin production.....	180
6.9.9	The Importance, Occurrence and Uses of Cyanobacteria in Nature and for Humans	180
6.10	Overview of the Current Status of Reservoirs in Slovakia	182
6.11	Methods to Eliminate Cyanobacteria on Water Reservoirs	185
6.11.1	Biological Method for Removing Cyanobacteria	186
6.11.2	Chemical Method for Removing Cyanobacteria.....	189
6.11.3	Physical Method for Removing Cyanobacteria.....	190

6.11.4	Mechanical Method for Removing Cyanobacteria.....	192
6.12	Methodology for Exact Monitoring of the Impact of Technology and Equipment for the Revitalization of Stagnant Waters.....	196
6.12.1	Sampling	197
6.12.2	Determination of the Number of Cyanobacteria and Algae from the Bioestone.....	198
	6.12.2.1. Sample Concentration Methods.....	199
6.12.3	Microscopic analysis	201
	6.12.3.1. Counting Chambers	201
	6.12.3.2. Counting Organisms.....	202
6.12.4	Determination of the Number of Individuals per 1 ml.....	204
	6.12.4.1. Disruptive Effects of the Determination.....	207
6.13	Technical Equipment for The Revitalization of Standing Waters	207
6.13.1	Float Equipment for Revitalization	207
	6.13.1.1. A Float Device with a Star Electrode Connected to a Diode Rectifier	207
6.13.2	Measuring the Range of Electrolytic Equipment.....	216
6.13.3	Verification of Technical Equipment in Practice.....	219
	6.13.3.1. Experiment in the interior	222
	6.13.3.2. Experiment outdoors	223
	6.13.3.3. Evaluation of the experiment	225
	6.13.3.4. Conclusion of the Experiment.....	228
6.13.4	Catamaran Equipment for the Collection of Neutralized Cyanobacteria and Algae.....	229
	6.13.4.1. Canonization Solutions of Catamaran Equipment.....	229
7	THE BASIC COMPONENT OF THE ENVIRONMENT - AIR (ATMOSPHERE)	239
7.1	Atmosphere and its Characteristics.....	239
7.2	Atmospheric Pollution	243
7.2.1	Sources of atmospheric pollution.....	245
7.2.2	Air Pollutants	246

	7.2.2.1. Particulate Pollutants (PP)	248
	7.2.2.2. Gaseous and Liquid Pollutants	250
7.3	Dispersion of Air Pollutants	255
7.4	Removal and Disposal of Air Pollution	258
	7.4.1 Devices for Removing Particulate Matter	258
	7.4.2 Removing a Restriction of Gaseous Pollutants	259
7.5	Determination of the Concentration of Solid Aerosols in the Technological Operation of Surface Mining of Mineral Raw Materials (in a Quarry).....	261
	7.5.1 Materials and Methods.....	264
	7.5.1.1. Determination of Sound Pressure Levels.....	264
	7.5.1.2. Sound Visualization	264
	7.5.1.3. Noise Mapping	264
	7.5.2 Description of the Problem.....	265
	7.5.2.1. Description of the Noise Source.....	265
	7.5.3 Knowledge of the Current State of the Noise Situation in the Adjacent Villages	267
	7.5.4 Measurement of the Noise Sources on the Site of the Wastewater Treatment Plant	268
	7.5.5 Visualization of the Noise Sources on the Site of the Wastewater Treatment Plant.....	269
	7.5.5.1. Measurement No. 1 - Air Distribution Pipes	269
	7.5.5.2. Measurement No. 2 - Blower Room Building (East Side).....	270
	7.5.5.3. Measurement No. 3 - Blower Room Building (South Side).....	272
	7.5.5.4. Measurement No. 4 - Sludge Treatment	273
	7.5.6 Proposal for Measures to Reduce Noise.....	275
	7.5.6.1. Acoustic Pipe Insulation	275
	7.5.6.2. Application of Acoustic Blinds.....	276
	7.5.7 Creating a Mathematical Model-Based Noise Map.....	276
	7.5.8 Verification of the Effectiveness of the Measures Implemented	280

8	BASIC COMPONENTS OF THE ENVIRONMENT - SOIL	283
8.1	Soil	283
8.1.1	Soil Formation.....	283
8.1.2	Soil Structure	284
8.1.3	Soil Water	285
8.2	Soil Characteristics.....	286
8.2.1	Soil Properties.....	286
8.2.1.1.	Chemical Properties of the Soil.....	286
8.2.1.2.	The Physical Properties of Soil.....	288
8.2.1.3.	Biological Properties of Soil	288
8.2.1.4.	Some Functional Properties of the Soil	288
8.2.1.5.	Fertility and Productive Capacity of the Soil.....	288
8.2.2	Allocation of Land.....	289
8.3	Self-cleaning of Soil.....	290
8.4	Degradation (Polluting) of Soil.....	291
8.4.1	Physical Soil Degradation.....	292
8.4.2	Chemical Soil Degradation.....	293
8.4.3	Biological Soil Degradation	297
8.5	Decontamination Polluted Soils	298
8.6	Soil Types and Grain Structures.....	299
8.6.1	Most Common Sources of Contamination	301
8.6.2	Description of Sampling Areas.....	302
8.6.3	Sampling	302
8.6.4	Determination of Heavy Metals in 2 M HN03 Leachate.....	306
9	ENGINEERING PRODUCTION AND ENVIRONMENT	308
9.1	Determining the Optimal Volume of Production Taking into Account Environmental Criteria.....	308
9.1.1	Environmental and Economic Factors and Their Expression	308
9.1.2	An Application in the Automotive Industry.....	311

9.2	Environmental Evaluation of Mechanical Engineering Products in their Conceptual Phase	313
9.2.1	D/D Procedure of MEP-s and its Formal Expression.....	314
9.2.2	Eco-Design Philosophy for MEP-s	315
9.2.3	Conceptual Phase of Eco-Design - The Most Important part of the MEP-s Life Cycle	316
9.2.4	The CoDe-09 Software and Applied Methods	317
	9.2.4.1. Structure of the CoDE-09 System.....	318
9.2.5	An Application in the Automotive Industry	319
BIBLIOGRAPHY.....		322
LIST OF FIGURES.....		336
LIST OF TABLES.....		345