

ECO Lab

Un exemplu numeric pentru modelarea ecologica



MIKE
BY DHI

The logo for MIKE BY DHI features the text 'MIKE' in a large, bold, white sans-serif font, with 'BY DHI' in a smaller, bold, white sans-serif font below it. To the right of the text is a stylized white graphic consisting of three overlapping, curved lines that resemble a wave or a ribbon.

Râuri si zone umede

- Oxigen, transport /degradare poluanti
- Retentia nutrientilor

Lacuri naturale si lacuri artificiale

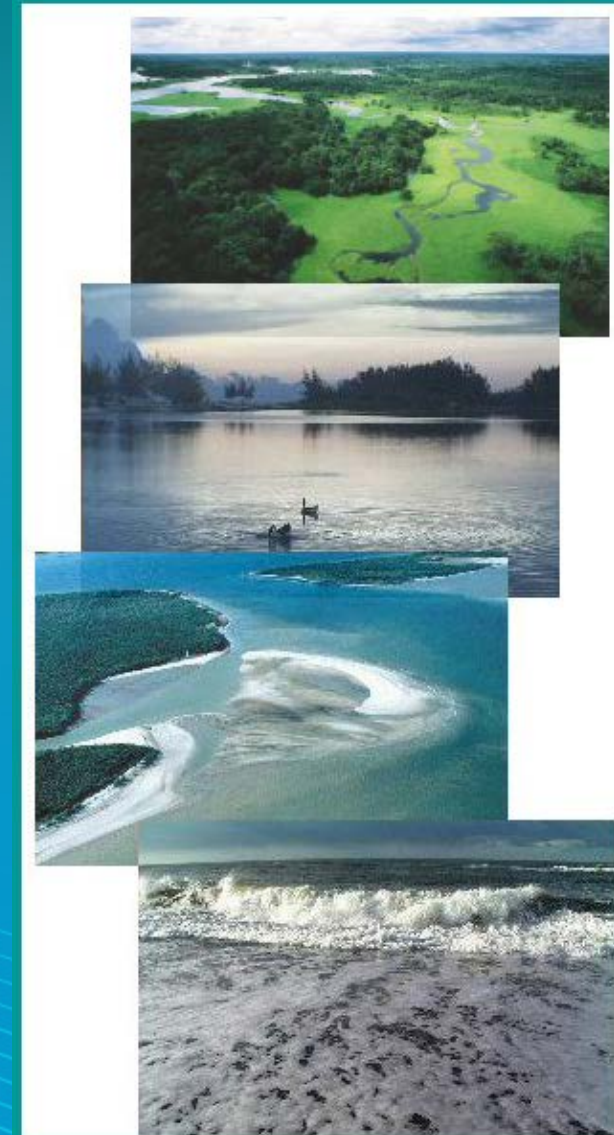
- Eutrofizarea
- Cianobacteria

Estuare

- Eutrofizare
- Macrofite
- Metale

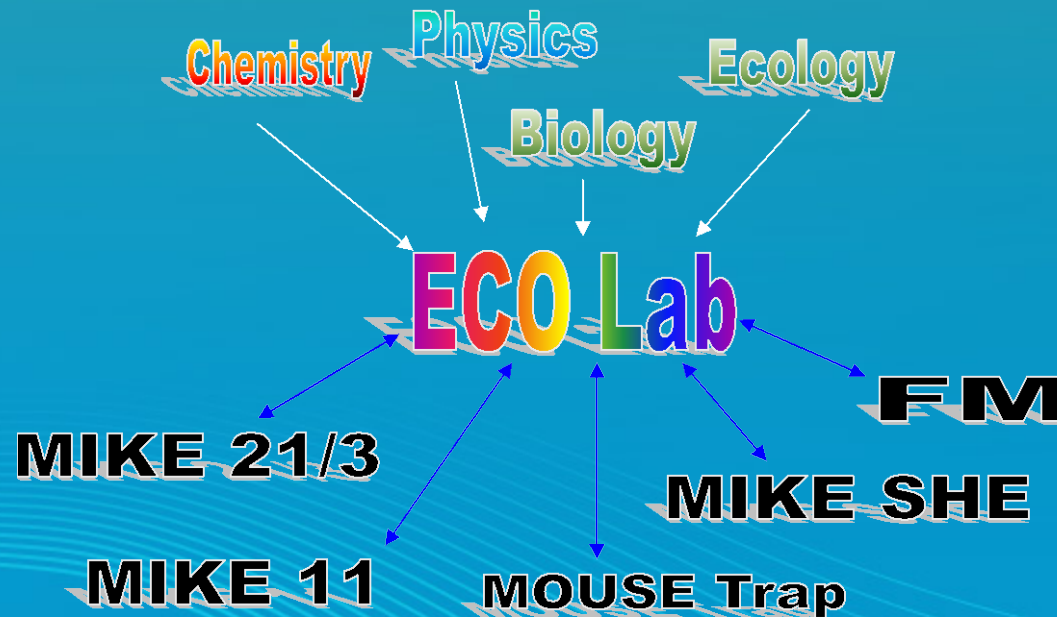
Ape de coasta si apa de mare

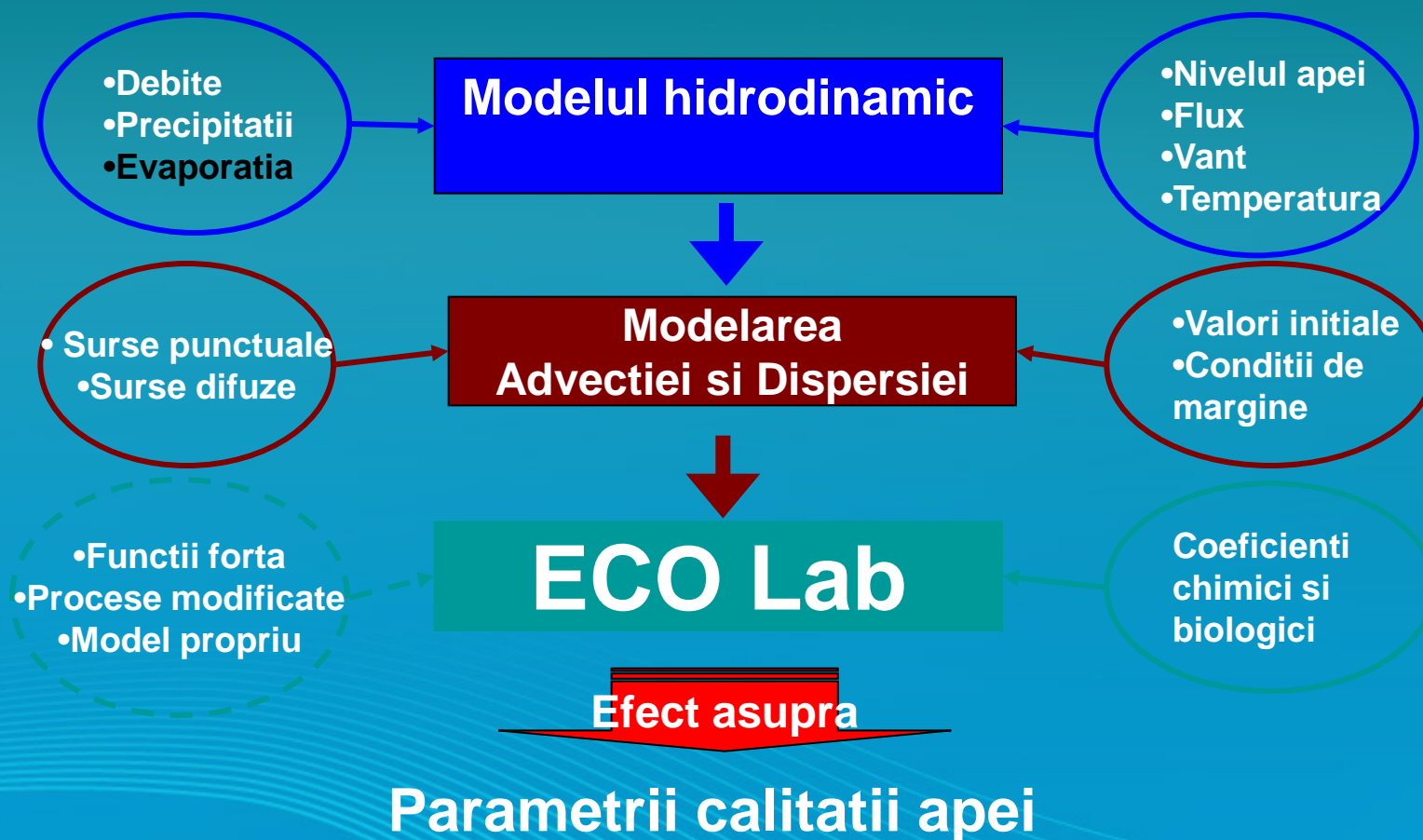
- Eutrofizare
- Calitatea apei pentru scaldat
- Aquaculture



Ce este ECO Lab?

- Ecuatiile rezolva perechile de ecuatii diferentiale folosite pentru descrierea proceselor de chimie, ecologie
- Toate ecuatiile si parametrii contin Eco Lab templates
- Templates includ informatii spatiale pentru aplicatiile 3D
- Sunt integrate in modelul hidrodinamic DHI

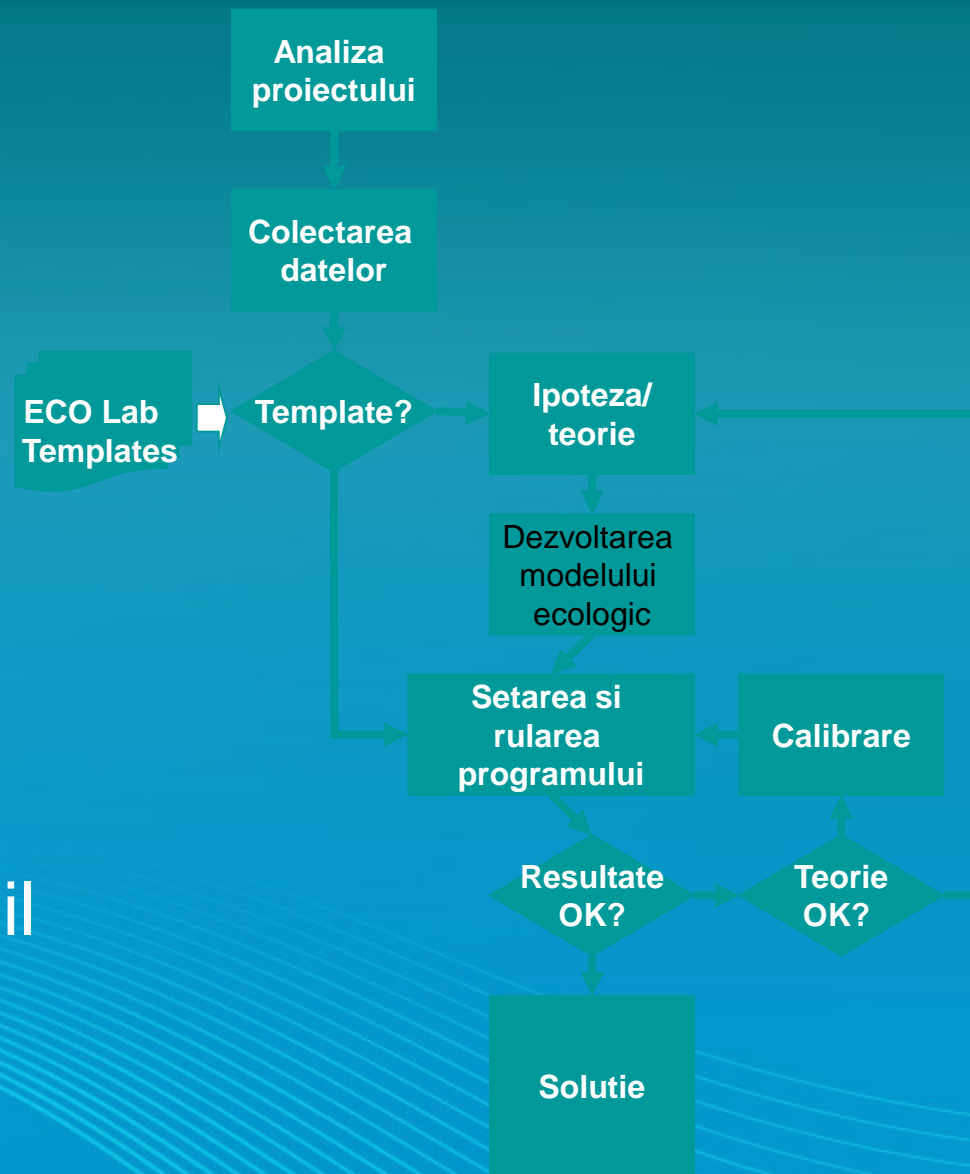




Usor

Deschis

Flexibil





- Apă potabilă
- Irigații
- Producere curent electric
- Apă pentru răcire
- Pescuit și acvacultură
- Industrie
- Recreere



WQ modelarea ca un instrument pentru
Managementul resurselor de apă

Interese	Obiective
Cercetări de mediu	'Stare naturală'
Pescuit	<ul style="list-style-type: none">• Zone de prohibiție pentru somon și păstrăv• Zone de trai pentru anumite specii
Alimentare cu apă	<ul style="list-style-type: none">• Potabilă• Udare• Irigare

Interese	Obiective
Industrie	<ul style="list-style-type: none">• Apa de răcire• Putere hidraulică• Apă de proces
Recreere	<ul style="list-style-type: none">• Viață sălbatică• Pescuit• Apă de curățire• 'Fără miros'• Canotaj

Parametrii fizici

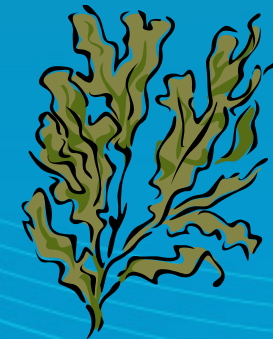
- Viscositate, Gravitație, Debit, Viteză, Temperatură etc.

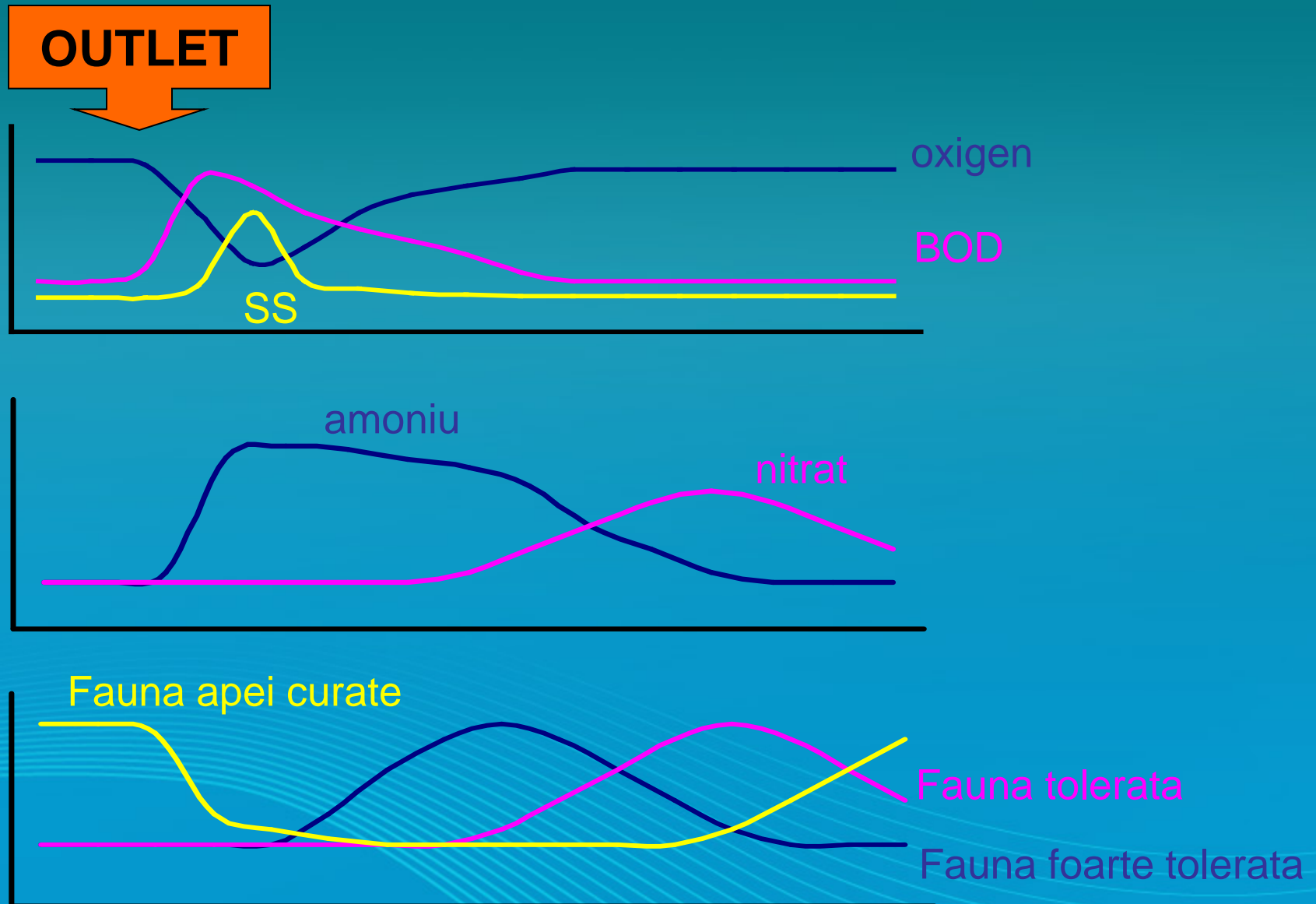
Parametri chimici

- pH, Alcalinitate, Chimicale, etc.

Parametri biologici

- Bacteria, Virusi, Alge, BOD, TOC, etc.





Incarcare in: kg/om/an



Codul țării

Poluanți	A	B	C	D
CCO	13	16	19	22
Fosfor	0.5	0.8	1.1	1.1
Nitrogen	4	4	4	5
Detergenti	0.2	0.3	0.6	0.8
TSS	20	25	30	30
E.coli	10^{10}	10^{10}	10^{10}	10^{10}

A: Africa, SE Asia, India, **B:** Carribean, Greece, Portugal
C: Italy, Spain, **D:** Northern Europe, Japan, North America

- Cele mai multe microorganisme care nu pot supraviețui în mediul patogene
 - E. coli ~ fecale ale omului și mamifere
 - non-patogenic
- Indicatorul pentru poluarea cu fecale
 - Faecal vs. Coliformi totali

EU standards:

- < 10.000 / (100 ml) total coliformi
- < 2.000 / (100 ml) fecal coliformi
- O dată la două săptămâni

In canalizare:

- Apă brută canalizare: 10^5 - 10^7 / 100 ml
- Tratare: mai mult de 99 % eliminat
(mecanic, biologic, chimic, N & P)

Proces	Variație 1000 CFU/100 ml	Reducere 10 ^x
U	330 – 22,000	
MB	50 – 2,000	0.5 – 1.5
MBN	20 – 100	0.5 – 2
ME	0.1 – 50	3 – 5
MBNDK	3 – 350	2 – 3.5
MBNDKF	0.4 - 50	2.5 – 4.5

U: Untreated	D: Denitrification	F: Filtration
B: Biological	K: Chemical	M: Mechanical
N: Nitrification	E: Precipitation	

Încărcarea în procentaj pe unitate de poluator:



Codul țării

Poluant	A	B	C	D
BOD	10	20	30	40
Phosphorus	5	10	15	20
Nitrogen	5	5	5	10
Mercury	10	20	30	40

Încărcarea in: kg/ha/year

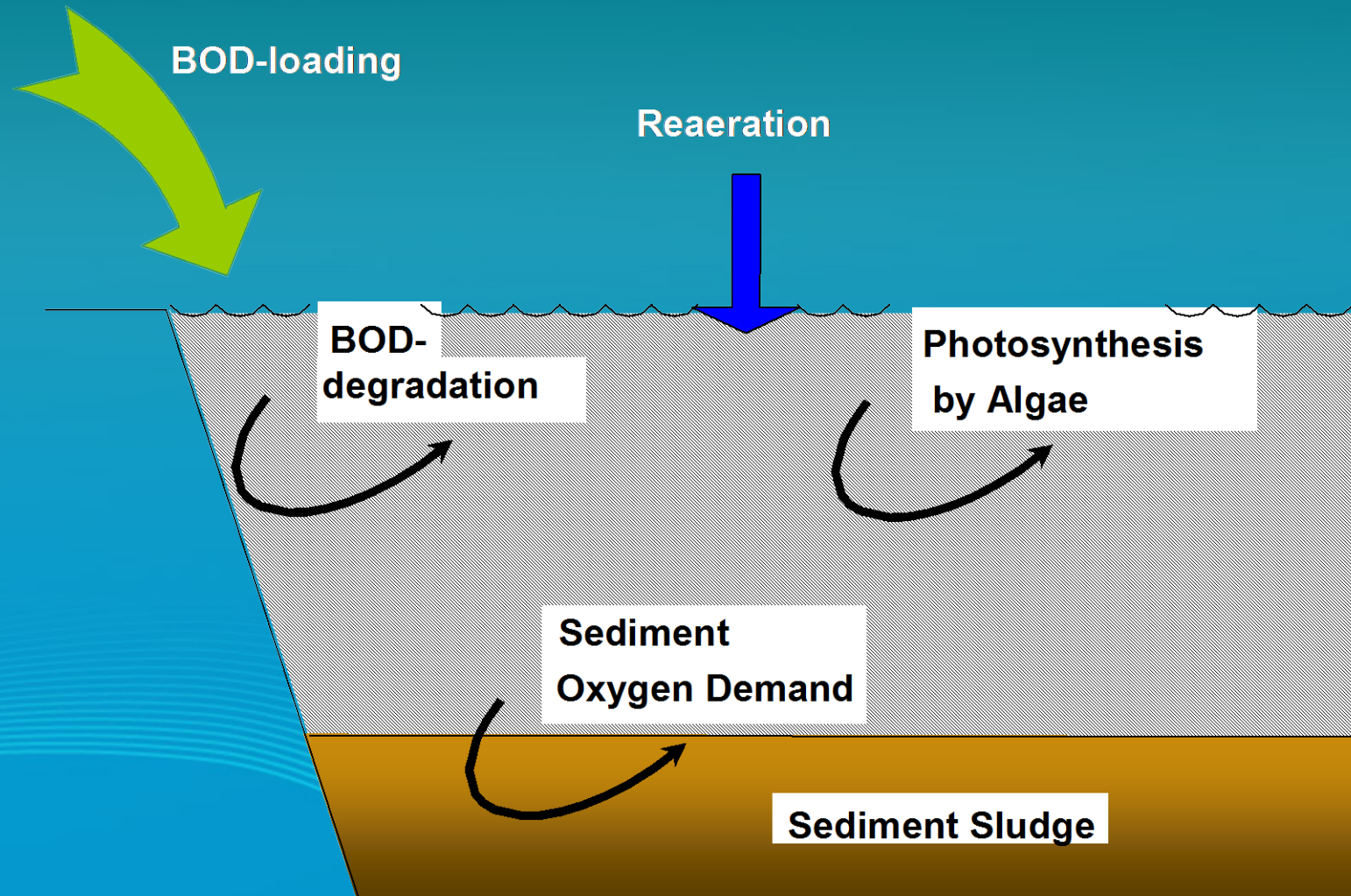


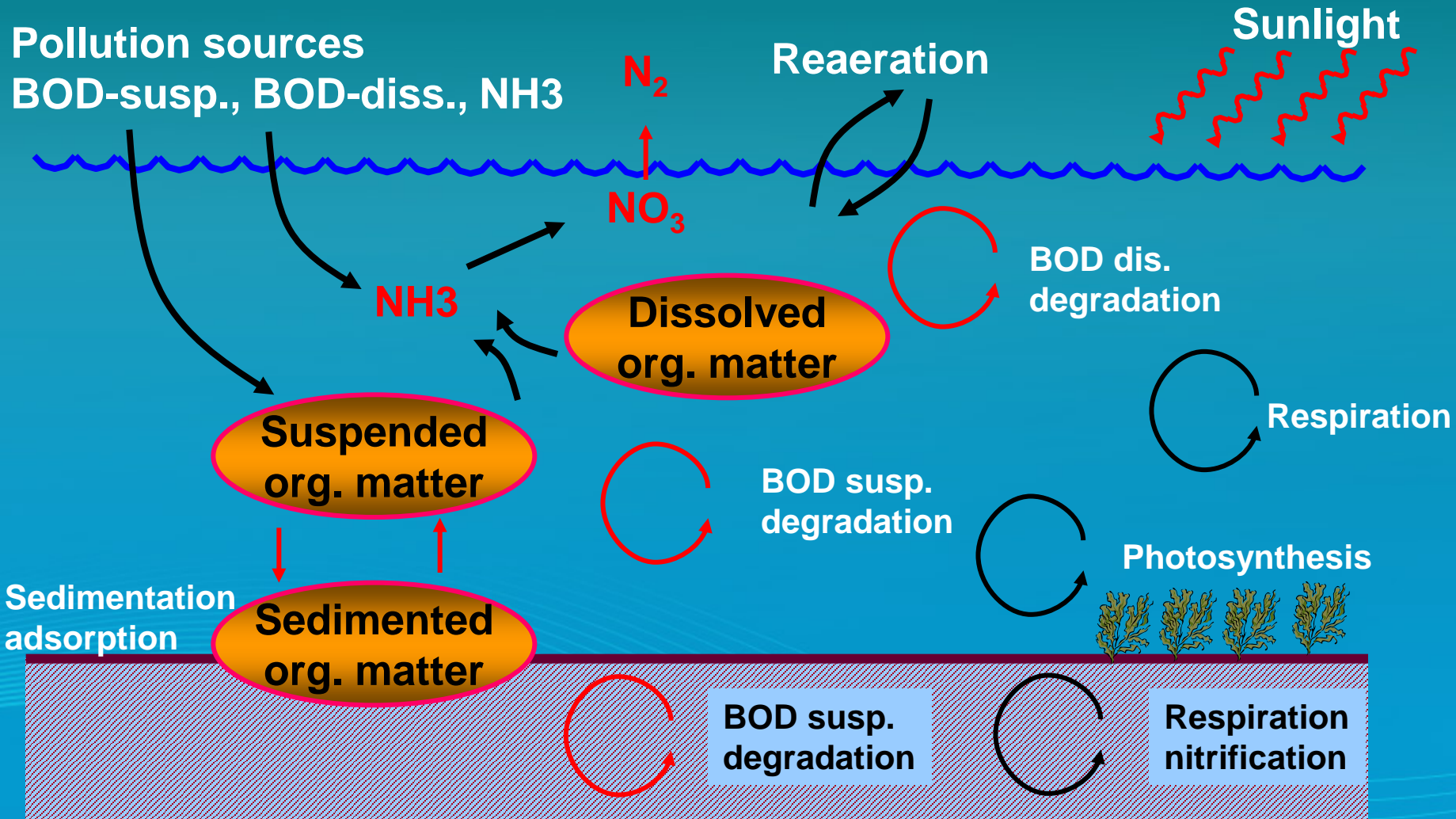
Folosirea fertilizatorului

Poluant	La nivelul solului		slab		inalt	
	N	P	N	P	N	P
Nesemnificativ	1	0.01	6	0.05	16	0.2
Slab	1	0.5	6	0.5	16	0.7
Moderat	3	2	7	2	17	2.2
Mare	5	4	10	4	20	4.2

Incarcarea in: kg/ha/year:

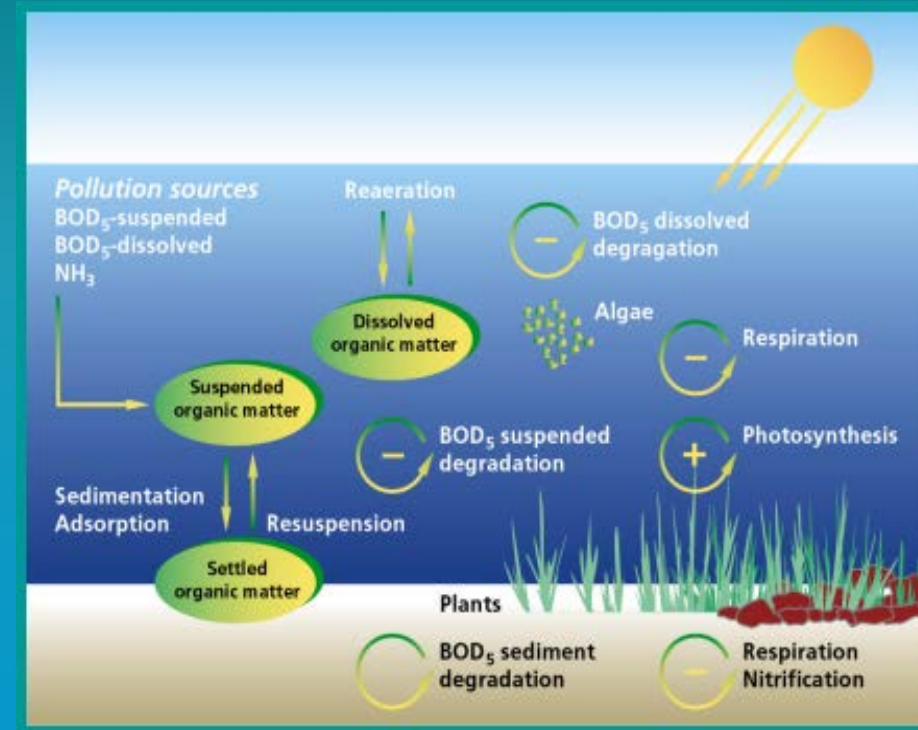
Poluant	Bays/open seas	Narrow estuaries/inland lakes
Nitrogen	0.5 – 30	3 – 10
Phosphorus	0.1 – 0.3	0.3 – 1
Lead	0.01 – 0.05	0.05 – 0.1
Cromium	0.001 – 0.003	0.003 – 0.005
Zink	0.05 – 0.10	0.1 – 0.3



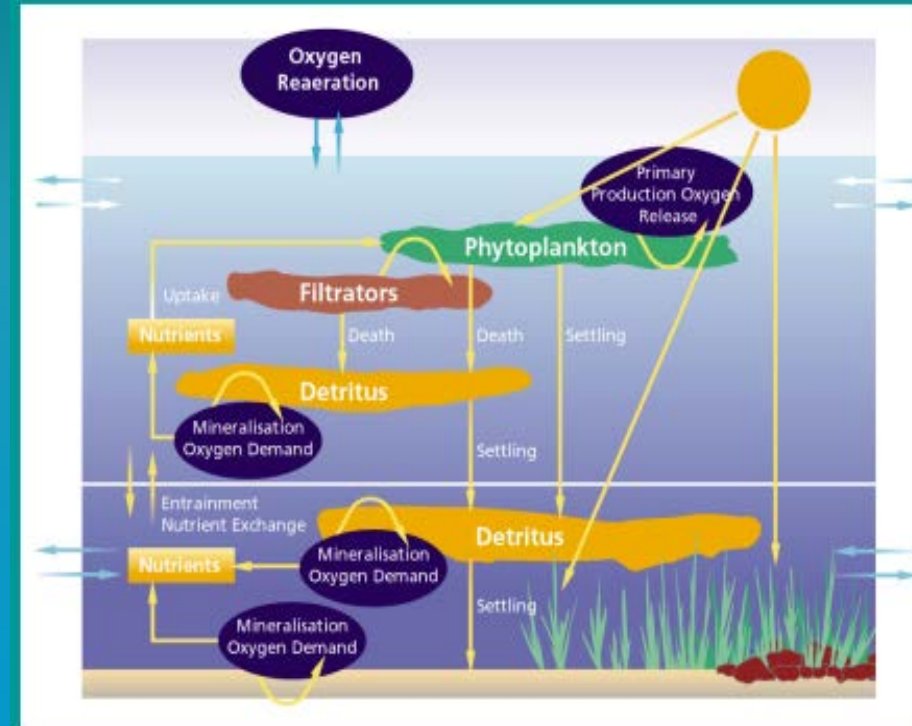


WQ templates descrie supravietuirea bacterilor, degradarea materilor organice conditiile pentru oxigen si excesul de nutrienti in corpul de apa.

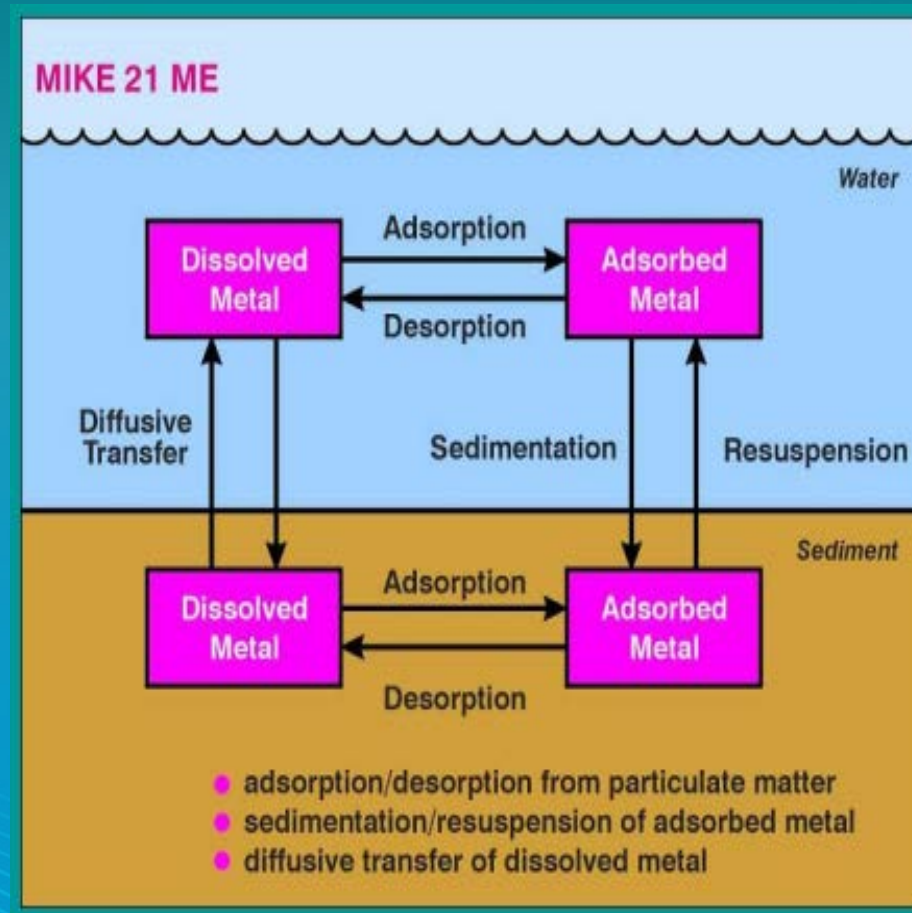
Templates acopera combinatii simple de variabile cum ar fi CCO si DO si combinatii mai complexe incluzand cele mai importante forme inorganice ale nitrogenului si ale fosforului.



Templatul eutrofizarii descrie rotatia nutrientilor cresterea ftoplantonului si a zooplantonului, cresterea vegetatiei inradacinata si a algelor pentru stimularea conditilor de oxigen.



Templatul de metale grele descrie adsorbția/desorbția metalelor în materiile în suspensie, sedimentarea metalelor absorbite de fundul mării precum și omogenizarea metalelor depuse.



Acest model descrie răspândirea și descompunerea de bacterii coliforme.

Degradare este descris ca dependent de lumina, salinitate și de temperatură.

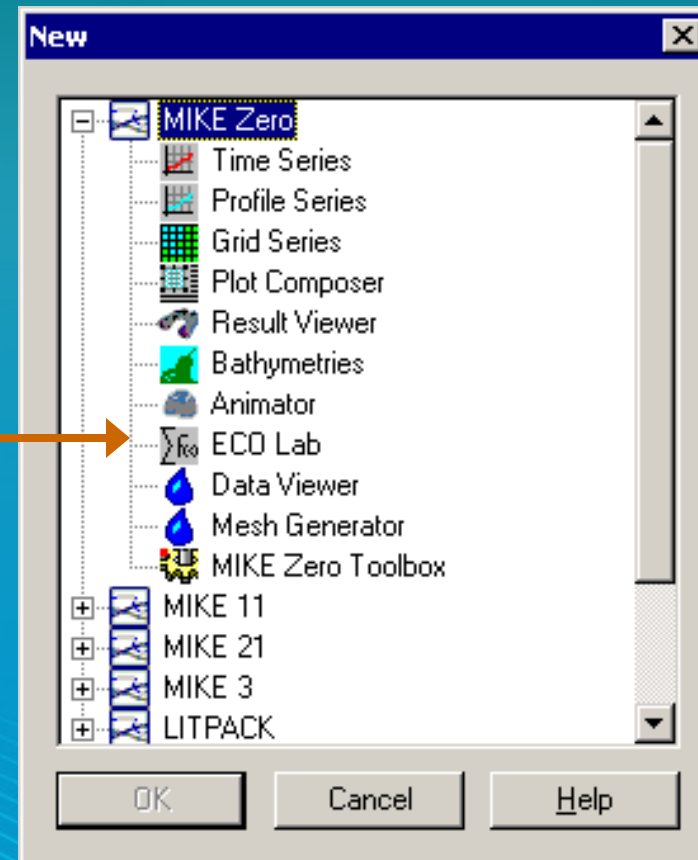
Model se aplică de obicei în gestionarea mediului în zonele utilizate pentru recreere și scăldat pentru a descrie calitatea apei pentru scăldat.



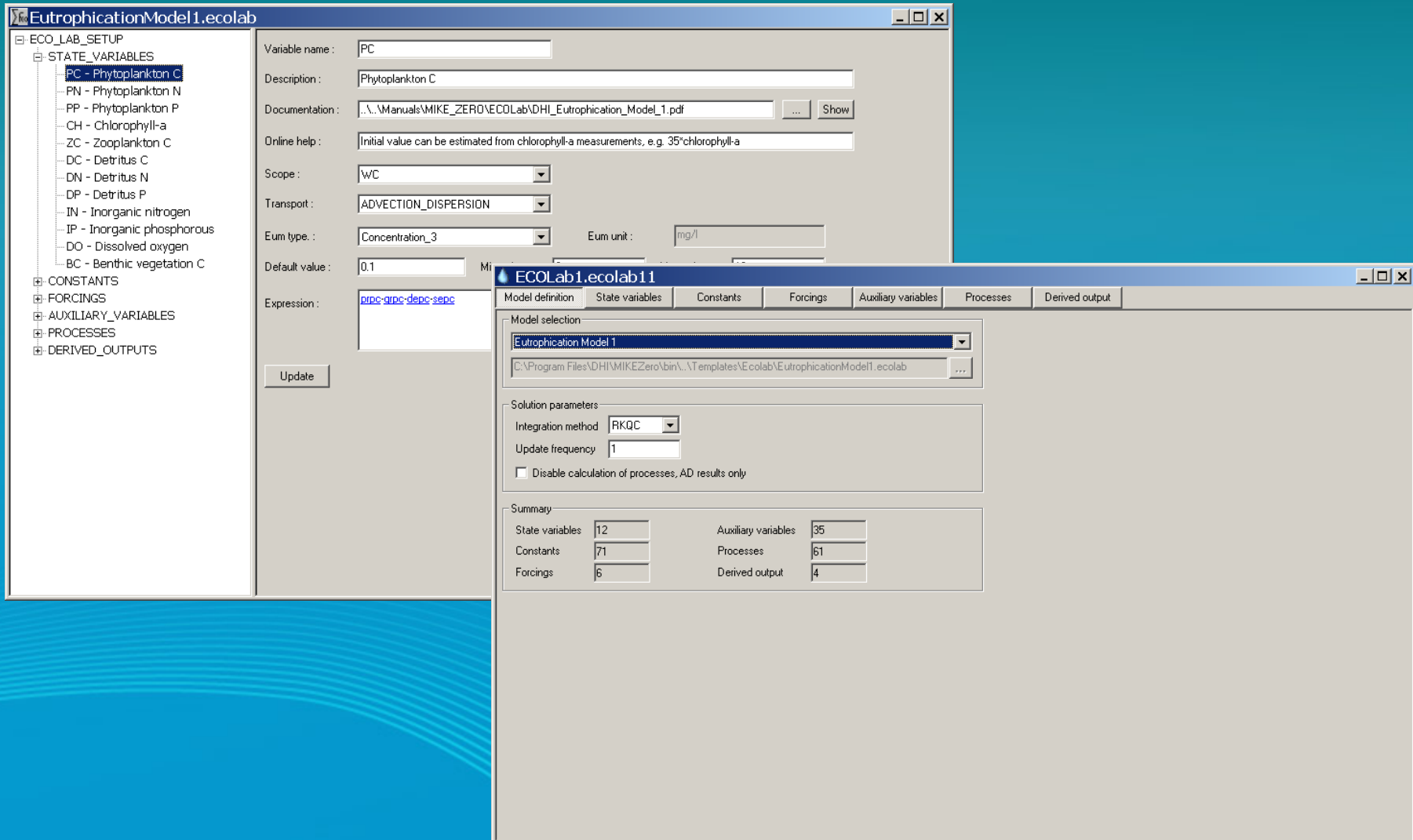
http://www.dhissoftware.com/ECOLab/Description/ECOLabTemplates_Coli.htm



ECO LAB interfață în ierarhia ZERO MIKE



Interfață

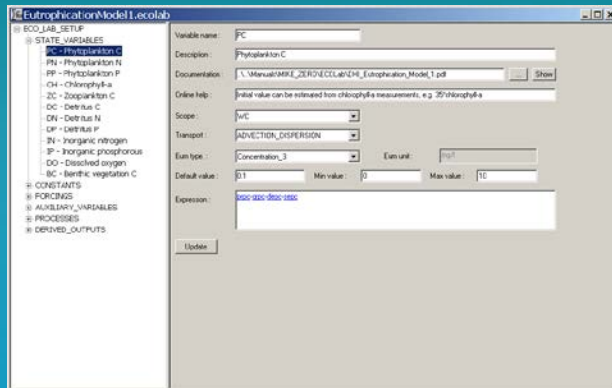


The screenshot displays the graphical user interface for the EutrophicationModel1.ecolab software. The interface is divided into several sections:

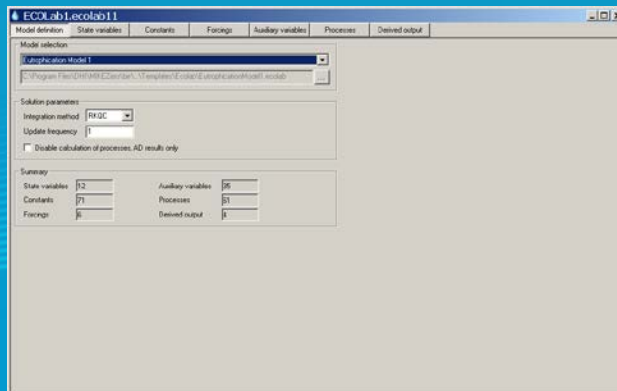
- Left Panel (ECO_LAB_SETUP):** A tree view showing the hierarchy of variables and parameters:
 - STATE_VARIABLES
 - PC - Phytoplankton C (selected)
 - PN - Phytoplankton N
 - PP - Phytoplankton P
 - CH - Chlorophyll-a
 - ZC - Zooplankton C
 - DC - Detritus C
 - DN - Detritus N
 - DP - Detritus P
 - IN - Inorganic nitrogen
 - IP - Inorganic phosphorous
 - DO - Dissolved oxygen
 - BC - Benthic vegetation C
 - CONSTANTS
 - FORCINGS
 - AUXILIARY_VARIABLES
 - PROCESSES
 - DERIVED_OUTPUTS
- Main Configuration Area:** Fields for defining the variable:
 - Variable name: PC
 - Description: Phytoplankton C
 - Documentation: ..\Manuals\MIKE_ZERO\ECOLab\DHI_Eutrophication_Model_1.pdf (with Show button)
 - Online help: Initial value can be estimated from chlorophyll-a measurements, e.g. 35*chlorophyll-a
 - Scope: wC
 - Transport: ADVECTION_DISPERSION
 - Eum type: Concentration_3
 - Eum unit: mg/l
 - Default value: 0.1
 - Expression: `ppc-gpc-depc-sepc`
 - Update button
- ECOLab1.ecolab11 (Model Selection Dialog):** A dialog box with tabs for Model definition, State variables, Constants, Forcings, Auxiliary variables, Processes, and Derived output.
 - Model selection: Eutrophication Model 1
 - File path: C:\Program Files\DHI\MIKEZero\bin\..\Templates\ECOLab\EutrophicationModel1.ecolab
 - Solution parameters:
 - Integration method: RKQC
 - Update frequency: 1
 - Disable calculation of processes, AD results only
 - Summary table:

State variables	12	Auxiliary variables	35
Constants	71	Processes	61
Forcings	6	Derived output	4

Interfață

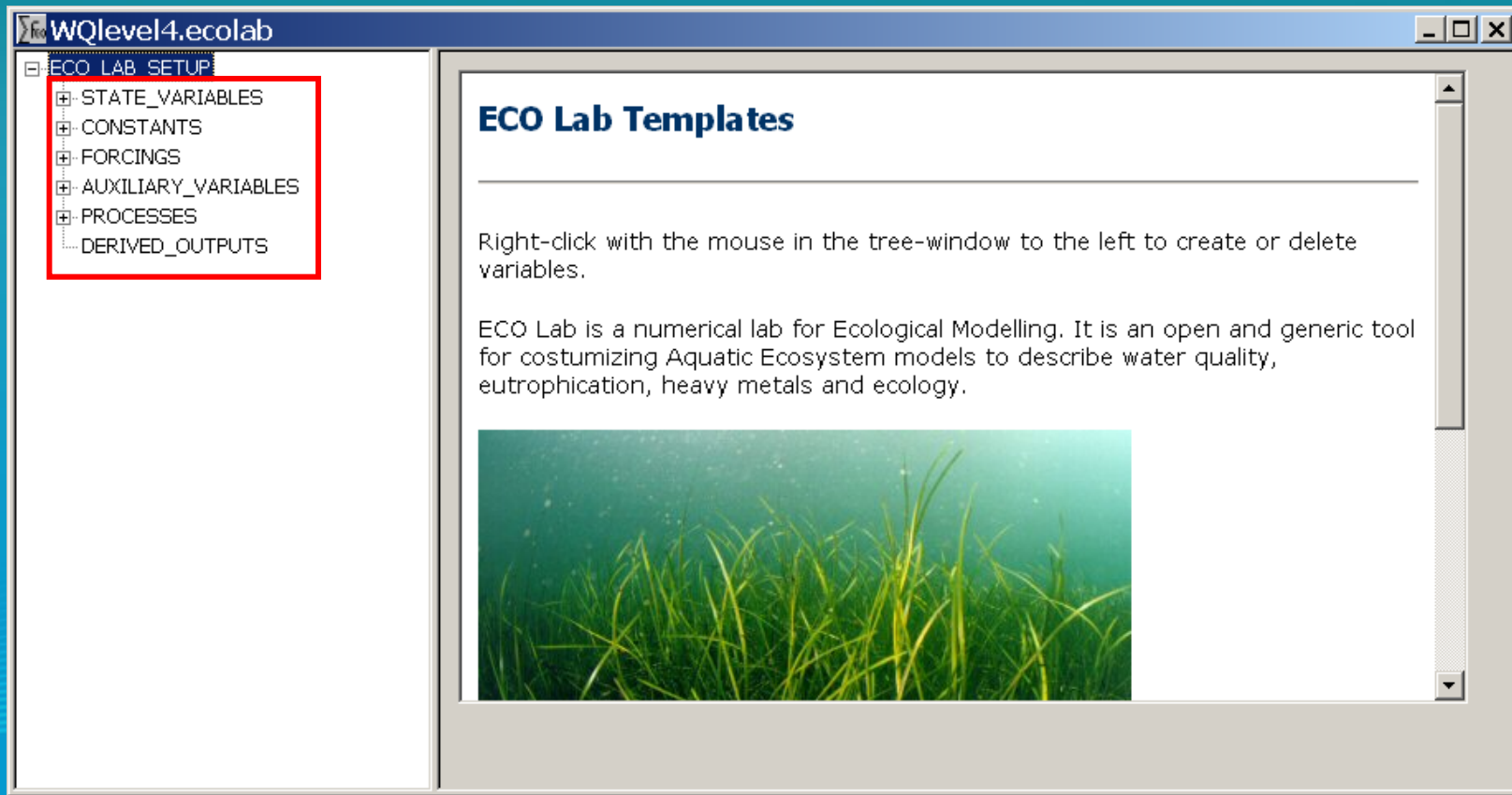


ECO Lab – Template Editor
- Aici se creează modelul



ECO Lab – Interface to Mike 11/21/3
-Aici puteti specifica valori pentru parametri și modelul este gata pentru simulare

ECO Lab – Template Editor



ECO Lab – Template Editor

The screenshot shows the 'WQlevel4.ecolab' window. On the left, a tree view under 'ECO_LAB_SETUP' shows 'STATE_VARIABLES' expanded, with 'DO - Dissolved oxygen' selected. A red arrow points to this selection. Below it, 'CONSTANTS', 'FORCINGS', 'AUXILIARY_VARIABLES', and 'PROCESSES' are listed and grouped by a red box. The right pane shows the configuration for 'DO':

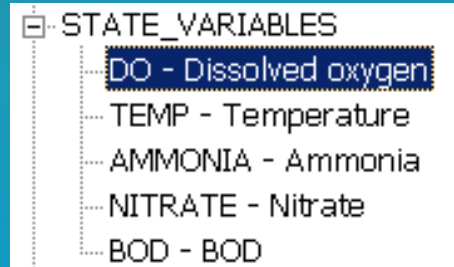
- Variable name: DO
- Description: Dissolved oxygen
- Documentation: ..\Manuals\MIKE_ZERO\ECOLab\ECOLAB_M11_WQ.pdf
- Online help: Initial value can often be estimated from measurements, alternatively saturation concentration from temperatu
- Scope: WC
- Transport: ADVECTION_DISPERSION
- Eum type: Concentration_3
- Eum unit: mg/l
- Default value: 10
- Min value: 0
- Max value: 18
- Expression: $reaera + phtsyn \cdot respI - bodd - SOD - OxygenConsumptionFromNitrification$

A red arrow points to the expression field.

ECO Lab - Template Editor

Variabile de stare

- 1) Re-aeration
- 2) Photosynthesis
- 3) Respiration
- plants
- 4) BOD degradare
- 5) Consumul de oxigen
- 6) Consumul de oxigen de la nitrificare



Scope :

Transport :

Eum type. : Eum unit :

Default value : Min value : Max value :

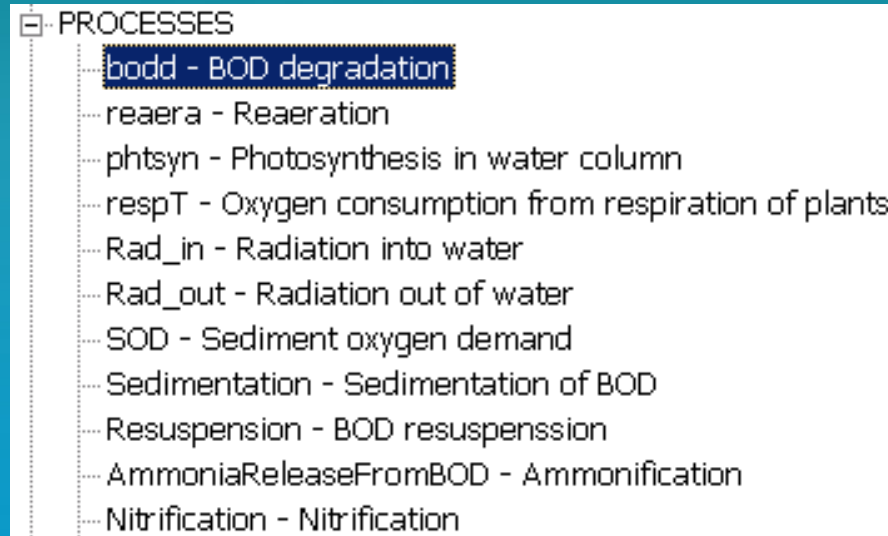
Expression :

- (1)
- (2)
- (3)
- (4)
- (5)
- (6)



ECO Lab - Template Editor

Procese



- 1) BOD rata de degradare
- 2) Corecția de temp.
- 3) BOD concentrație
- 4) Limitare oxigen

Process type :

Eum type : Unit :

Expression :

(1)

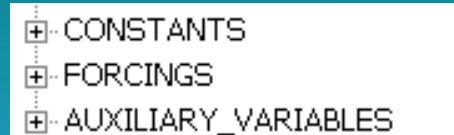
(2)

(3)

(4)

ECO Lab - Template Editor

Alte categorii



Constant – BOD decay rate

Built in id :	<input type="text"/>	User specified :	<input type="text" value="YES"/>
Eum type. :	<input type="text" value="1st order rate WQ model"/>	Eum unit :	<input type="text" value="per day"/>
Default value :	<input type="text" value="0.5"/>	Min value :	<input type="text" value="0"/>
		Max value :	<input type="text" value="5"/>

Forcing – Water velocity

Built in id :	<input type="text" value="HORIZONTAL_CURRENT_SPEED"/>	User specified :	<input type="text" value="NO"/>
Eum type. :	<input type="text" value="Undefined"/>	Eum unit :	<input type="text" value="m/s"/>
Default value :	<input type="text" value="0.2"/>	Min value :	<input type="text" value="0"/>
		Max value :	<input type="text" value="10"/>

Auxiliary – Oxygen saturation

Eum type. :	<input type="text" value="Undefined"/>	Unit :	<input type="text" value="mg/l"/>
Expression :	<input type="text" value="OXYGENSATURATION(sali,TEMP)"/>		

ECO Lab interfață (MIKE 11)

Definirea modelului

WQlevel4.ecolab11

Model definition | State variables | Constants | Forcings | Auxiliary variables | Processes | Derived output

Model selection

MIKE 11 WQ Level 4

C:\Program Files\DHI\MIKEZero\bin\..\Templates\Ecolab\WQlevel4.ecolab

Solution parameters

Integration method: EULER

Update frequency: 1

Disable calculation of processes, AD results only

Summary

State variables	5	Auxiliary variables	17
Constants	41	Processes	15
Forcings	4	Derived output	0

ECO Lab interfață

Valori inițiale pentru fiecare variabilă de stare

WQlevel4.ecolab11

Model definition | State variables | Constants | Forcings | Auxiliary variables | Processes | Derived output

	Description	Transport	Type	Unit	Value	Local
1	Dissolved oxygen	Transport	Concentration_3	mg/l	10	...
2	Temperature	Transport	Undefined	Degrees	15	...
3	Ammonia	Transport	Concentration_3	mg/l	0	...
4	Nitrate	Transport	Concentration_3	mg/l	0	...
5	BOD	Transport	Concentration_3	mg/l	1	...

ECO Lab interfață

Parametrii ~ e.g. rate constante

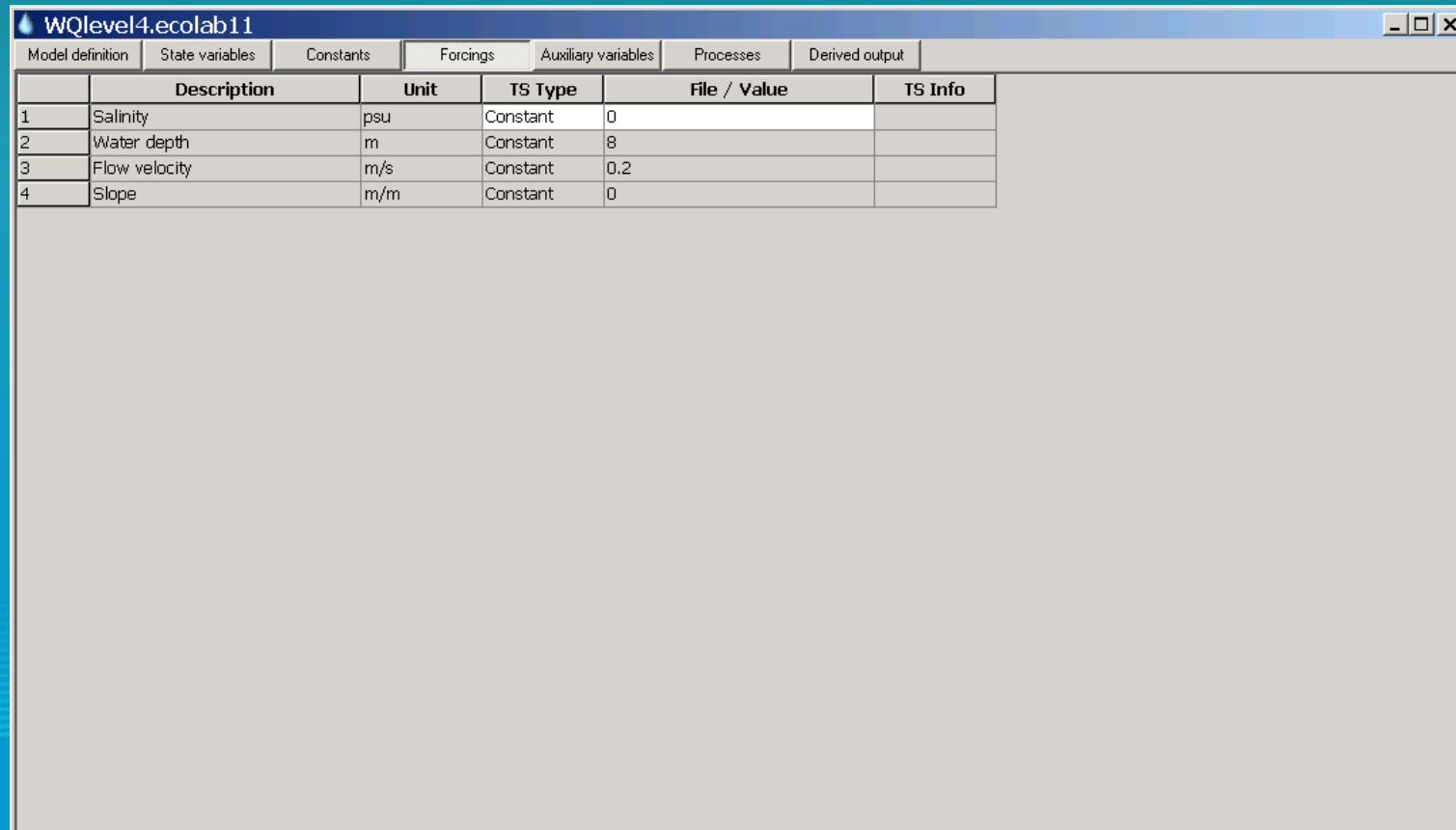
WQlevel4.ecolab11

Model definition | State variables | **Constants** | Forcings | Auxiliary variables | Processes | Derived output

	Description	Unit	Value	Local
14	Oxygen Processes: Own #1 Reaeration constant	per day	1	
15	Oxygen Processes: Own #1 Exponent, flow velocity	dimensionless	0	
16	Oxygen Processes: Own #1 Exponent, water depth	dimensionless	0	
17	Oxygen Processes: Own #1 Exponent, river slope	dimensionless	0	
18	Oxygen Processes: Own #2 Reaeration constant	per day	1	
19	Oxygen Processes: Own #2 Exponent, flow velocity	dimensionless	0	
20	Oxygen Processes: Own #2 Exponent, flow velocity	dimensionless	0	
21	Oxygen Processes: Own #2 Exponent, river slope	dimensionless	0	
22	Oxygen Processes: Own #3 Reaeration constant	per day	1	
23	Oxygen Processes: Own #3 Exponent, flow velocity	dimensionless	0	
24	Oxygen Processes: Own #3 Exponent, flow velocity	dimensionless	0	
25	Oxygen Processes: Own #3 Exponent, river slope	dimensionless	0	
26	Sediment processes: Sediment oxygen demand	g/m2/day	0.5	Edit
27	Sediment processes: Temperature coefficient SOD	Dimensionless	1	Edit
28	Sediment processes: Resuspension of organic matter	g/m2/day	0.5	Edit
29	Sediment processes: sedimentation rate for organic matter	m/day	0.8	Edit
30	Sediment processes: Critical flow velocity	m/s	1	Edit
31	Nitrogen Content: Ratio of ammonia released at BOD decay	gNH4/gBOD	0.29	Edit
32	Nitrogen Content: Uptake of ammonia in plants	Dimensionless	0.066	Edit
33	Nitrogen Content: Uptake of ammonia in bacteria	Dimensionless	0.109	Edit
34	Nitrification: Reaction order 1 = first order process 2 = half order process	Dimensionless	1	Edit
35	Nitrification: Ammonia decay rate at 20 deg Celcius	per day	1.54	Edit
36	Nitrification: Temperature coefficient for nitrification	dimensionless	1.13	Edit
37	Denitrification: Oxygen demand by nitrification	gO2/gHN4	4.47	Edit
38	Denitrification: Half saturation constant	mg/l	0.05	Edit
39	Denitrification: Reaction order 1 = first order process 2 = half order process	Dimensionless	1	Edit
40	Denitrification: Denitrification rate, conversion of nitrate into free nitrogen N2	1/day	1	Edit
41	Denitrification: Temperature coefficient for denitrification	Dimensionless	1.16	Edit

ECO Lab interfață

Functii de bază



WQlevel4.ecolab11

Model definition | State variables | Constants | Forcings | Auxiliary variables | Processes | Derived output

	Description	Unit	TS Type	File / Value	TS Info
1	Salinity	psu	Constant	0	
2	Water depth	m	Constant	8	
3	Flow velocity	m/s	Constant	0.2	
4	Slope	m/m	Constant	0	

ECO Lab interface

Result Out-put (e.g. Processes)

WQlevel4.ecolab11

Model definition | State variables | Constants | Forcings | Auxiliary variables | Processes | Derived output

	Description	Select
1	BOD degradation	<input type="checkbox"/>
2	Reaeration	<input type="checkbox"/>
3	Photosynthesis in water column	<input type="checkbox"/>
4	Oxygen consumption from respiration of	<input type="checkbox"/>
5	Radiation into water	<input type="checkbox"/>
6	Radiation out of water	<input type="checkbox"/>
7	Sediment oxygen demand	<input type="checkbox"/>
8	Sedimentation of BOD	<input type="checkbox"/>
9	BOD resuspension	<input type="checkbox"/>
10	Ammonification	<input type="checkbox"/>
11	Nitrification	<input type="checkbox"/>
12	N uptake plants	<input type="checkbox"/>
13	N uptake bacteria	<input type="checkbox"/>
14	Oxygen consumption nitrification	<input type="checkbox"/>
15	Denitrification	<input type="checkbox"/>

Modelarea ecologică nu este limitată de implementarea tehnică a cunoștințelor ecologice noi, dar cunoștințele despre ecosisteme și procese este în sine o limitare.



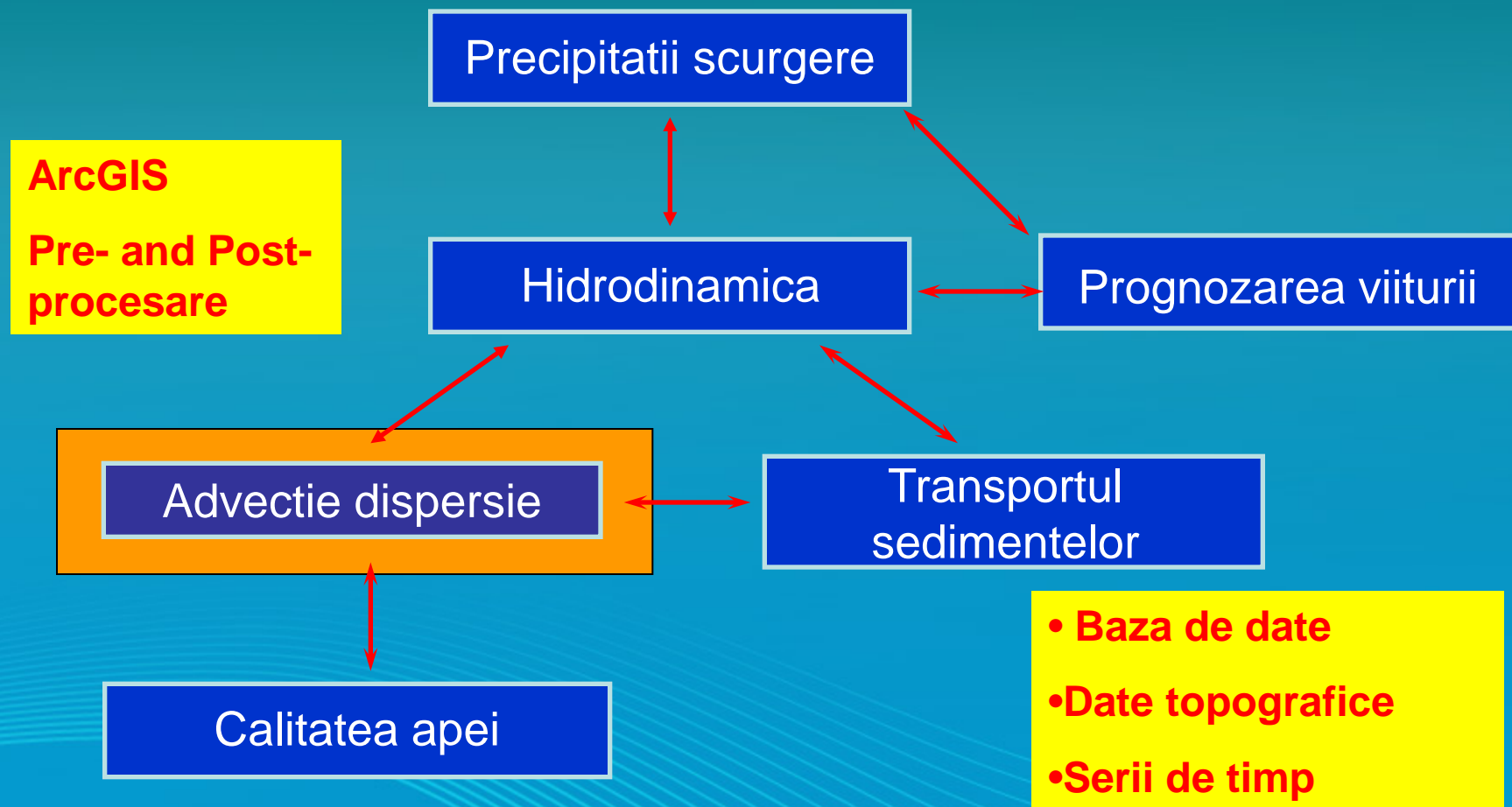
- ECO Lab in zone uscate
- Utilizatorul poate specifica ce trebuie modelat de exemplu, înotarea peștilor împotriva curentului într-un râu.

MIKE 11 MODULUL DE ADVECTIE DISPERSIE

MIKE
BY DHI

The logo features the word "MIKE" in a large, bold, white sans-serif font. Below it, the words "BY DHI" are written in a smaller, bold, white sans-serif font. To the right of the text is a stylized white graphic consisting of three thick, curved lines that overlap and cross each other, resembling a wave or a stylized letter 'E'.

Structura modulara

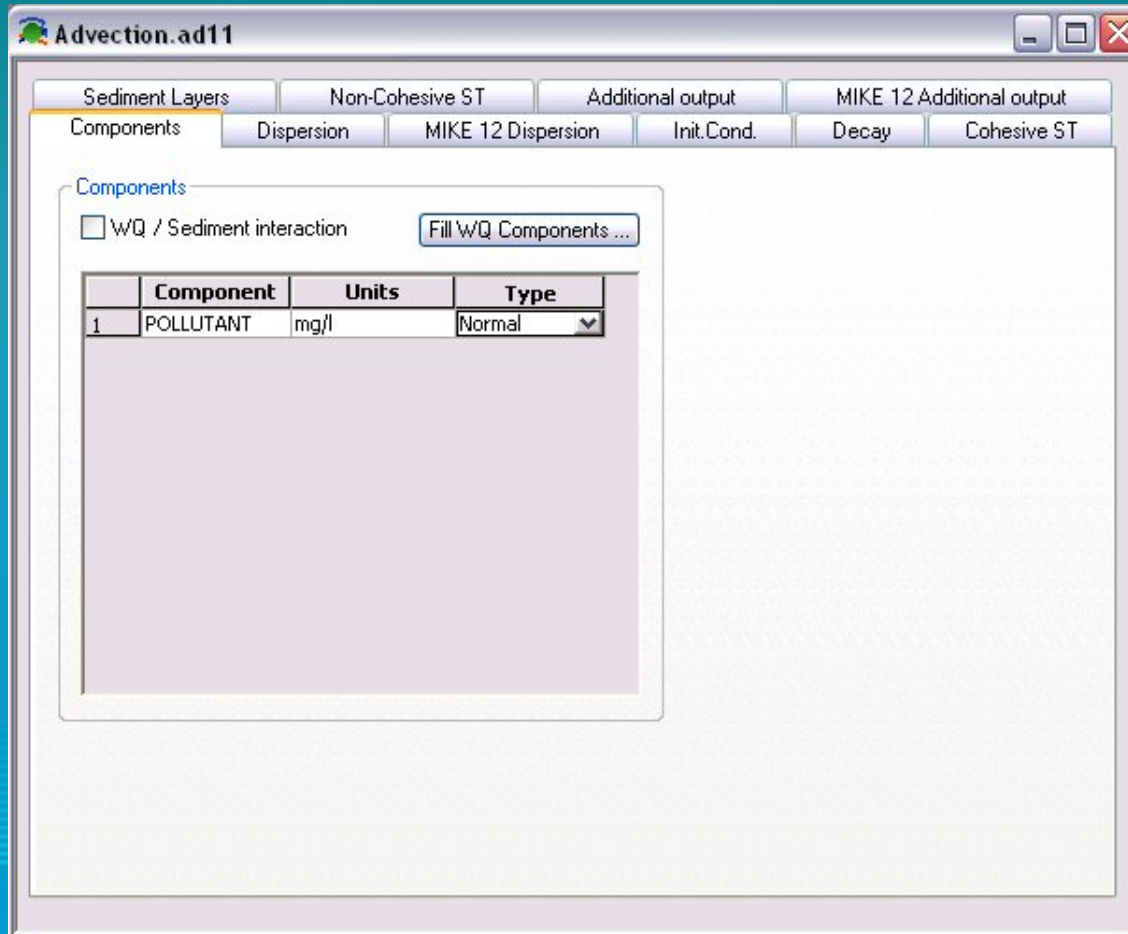


MIKE 11 Modulul de advecție-dispersie

Simularea transportului unidimensional al materilor dizolvate sau în suspensie dintr-un râu

- Modelarea advecției și dispersiei
 - Intruziunea salinității
 - Temperatura
 - Transportul poluanților
 - 1st Order Decay
 - Transportul sedimentelor coezive

Specificarea componentelor



Specificarea dispersiei

Advection.ad11

Sediment Layers Non-Cohesive ST Additional output MIKE 12 Additional output

Components Dispersion MIKE 12 Dispersion Init.Cond. Decay Cohesive ST

Dispersion coefficients/factors

Global values

Dispersion factor 0.000

Exponent 0.000

Minimum disp. coefficient 0.000

Maximum disp. coefficient 100.000

Local values

	River Name	Chainage	Dispersion factor	Exponent	Minimum coef.	Maximum coef.
1			0	0	0	100

$$D = \text{factor} \cdot V^{\text{Exponent}}$$

Unde : V- viteza curentului

Specificarea concentratiei initiale

Advection.ad11

Sediment Layers Non-Cohesive ST Additional output MIKE 12 Additional output

Components Dispersion MIKE 12 Dispersion **Init. Cond.** Decay Cohesive ST

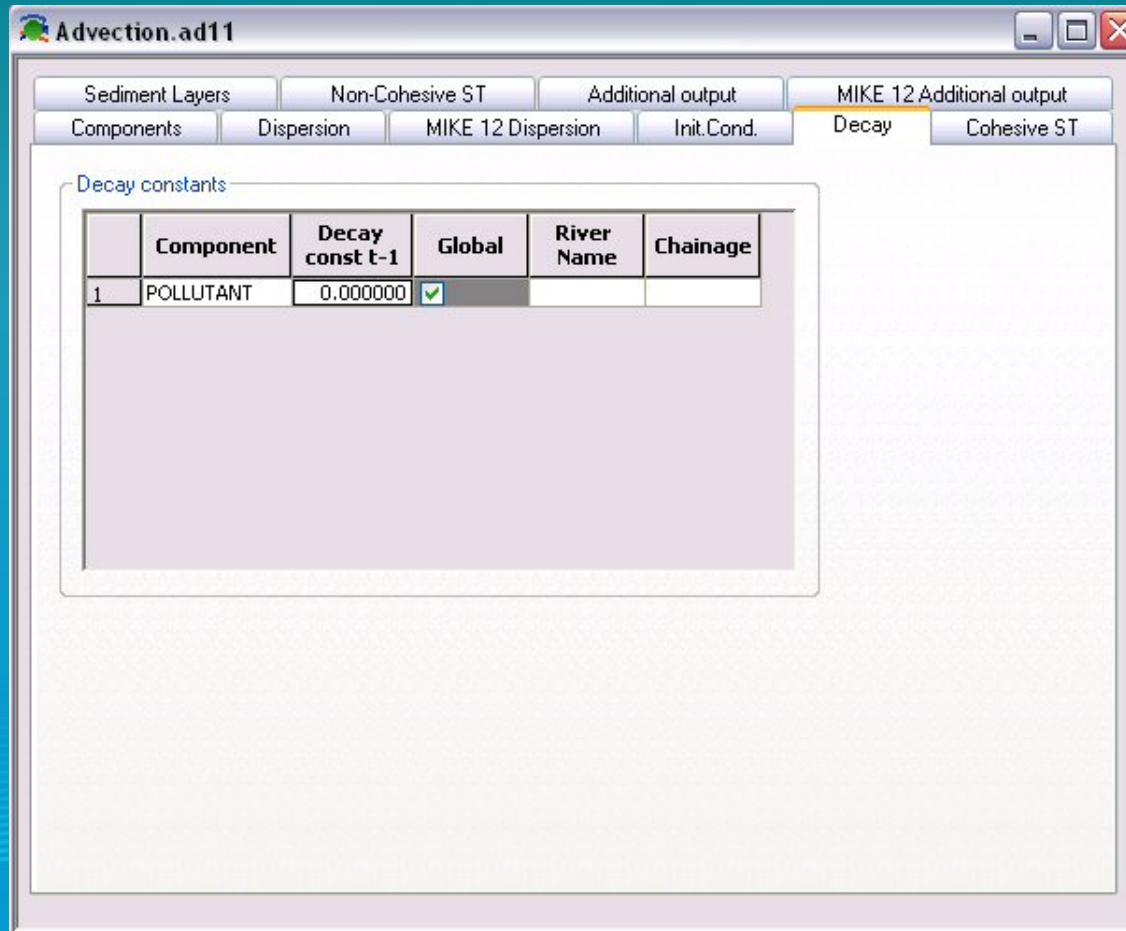
Initial conditions

	Component	Concentration	Global	River Name	Chainage
1	POLLUTANT	0.000000	<input checked="" type="checkbox"/>		

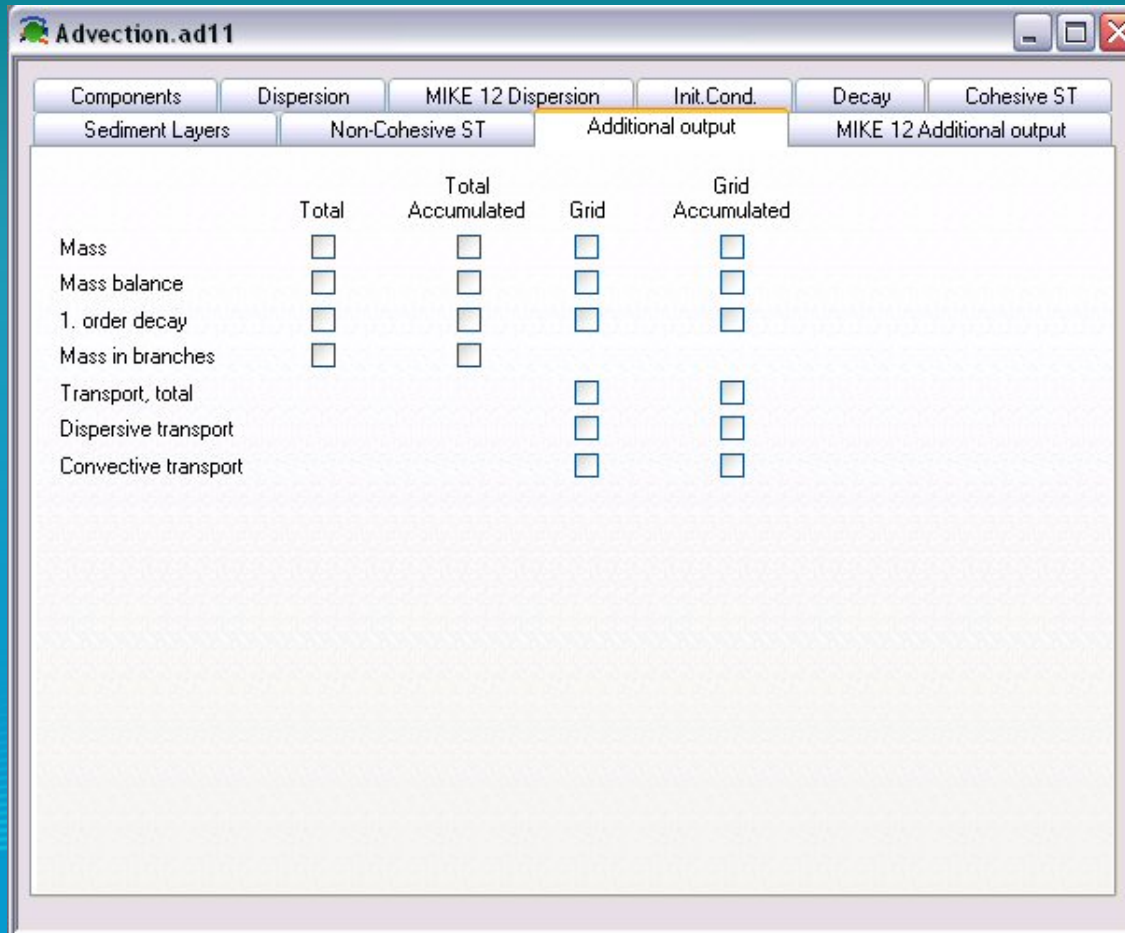
Initial conditions - Stratification

	Componen	Conc. 5	Conc. 2	Conc. 3	Conc. B	k2	k3	Globa	River Name
1	Undefin	0	0	0	0	0	0	<input checked="" type="checkbox"/>	

Posibilitatea de descompunere - 1st order decay



Date de iesire aditionale



The screenshot shows the 'Advection.ad11' window with the 'Additional output' tab selected. The window contains a table of output options with checkboxes for selection.

	Total	Total Accumulated	Grid	Grid Accumulated
Mass	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mass balance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1. order decay	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mass in branches	<input type="checkbox"/>	<input type="checkbox"/>		
Transport, total			<input type="checkbox"/>	<input type="checkbox"/>
Dispersive transport			<input type="checkbox"/>	<input type="checkbox"/>
Convective transport			<input type="checkbox"/>	<input type="checkbox"/>

Specificarea conditiilor de margine(AD-Modelling)

Advection.bnd11

	Boundary Description	Boundary Type	Branch Name	Chainage	Chainage	Gate ID	Boundary ID
1	Open	Water Level		0	0		

Conditile HD and AD
specificate in aceiasi pagina

Include AD boundaries
 Mike 12

Trebuie selectate din for AD boundaries

	Data Type	TS Type	File / Value	TS Info	AD boundaries	K-mix
1	Water Level	TS File	<input type="button" value="Edit"/>		open, concentrat open, transport open, concentrat TS-defined	0

Tipul AD boundary - asociate

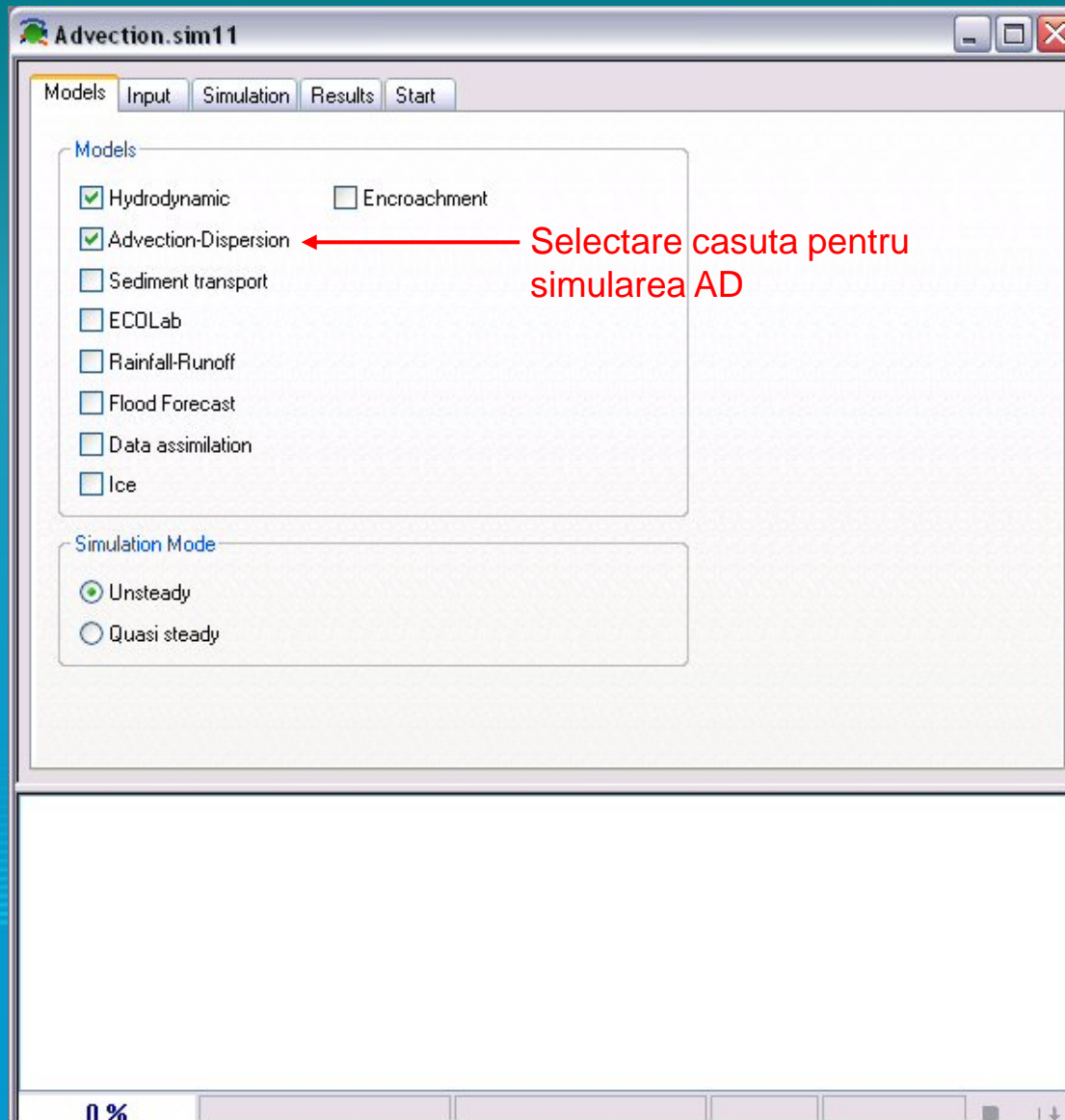
Coeficient de amestec aplicat
conditiile pentru concentratie

Specificarea HD boundary

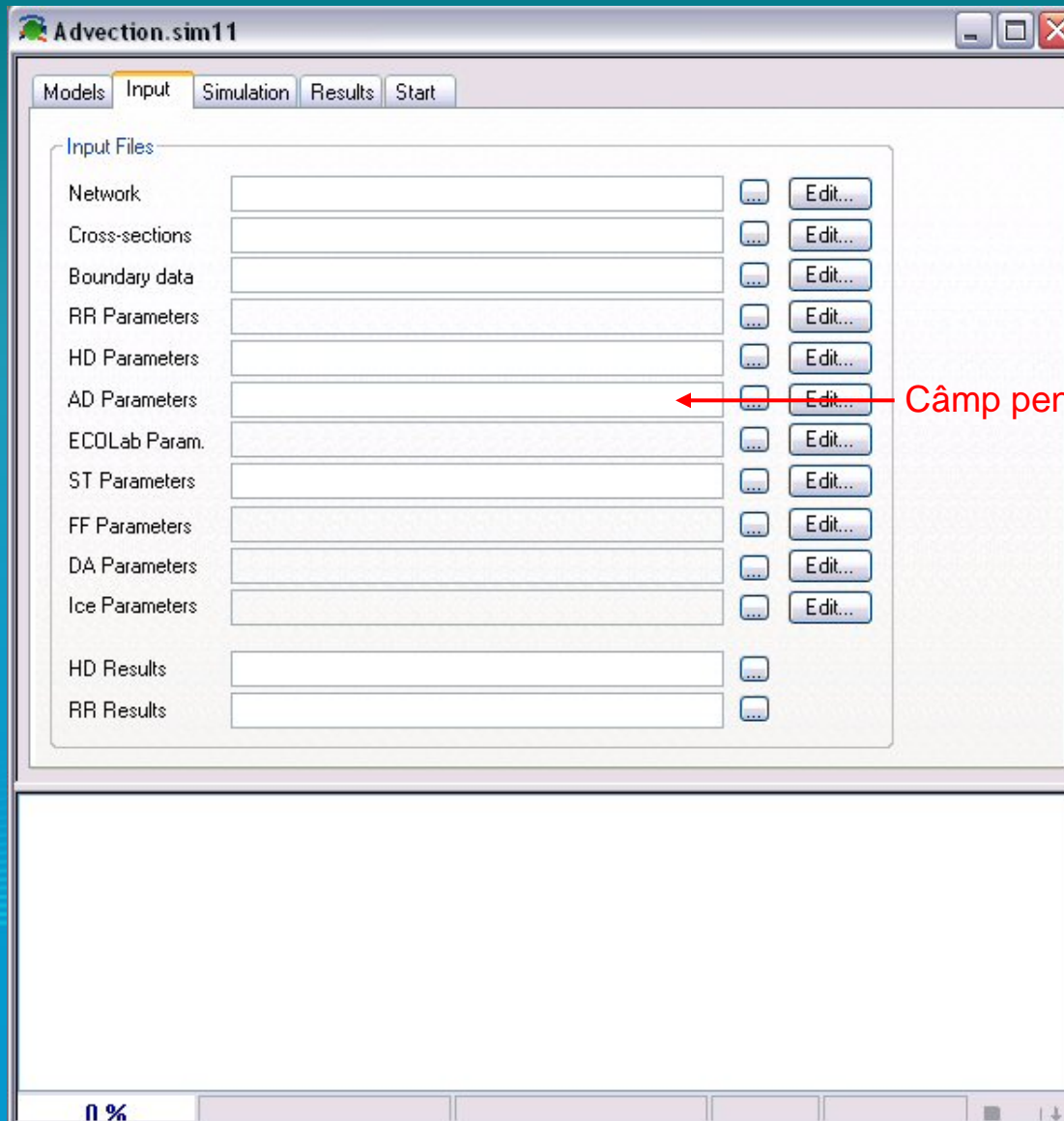
	Component	Data Type	TS Type	File / Value	TS Info	Scale Facto
1	1	Concentra	TS File	<input type="button" value="Edit"/>		1

Specificarea AD boundary

Simulation Specifications (AD-Modelling)



Simulation Specifications (AD-Modelling)



← Câmp pentru datele cu parametri AD

Simulation Specifications (AD-Modelling)

Advection.sim11

Models Input Simulation Results Start

Simulation Period

Time step type Time step Unit

Fixed time step 30 Min.

Simulation Start Simulation End

Period: 01/01/1990 12:00:00 01/02/1990 12:00:00 Apply Default

ST time step multiplier 1 RR time step multiplier 1

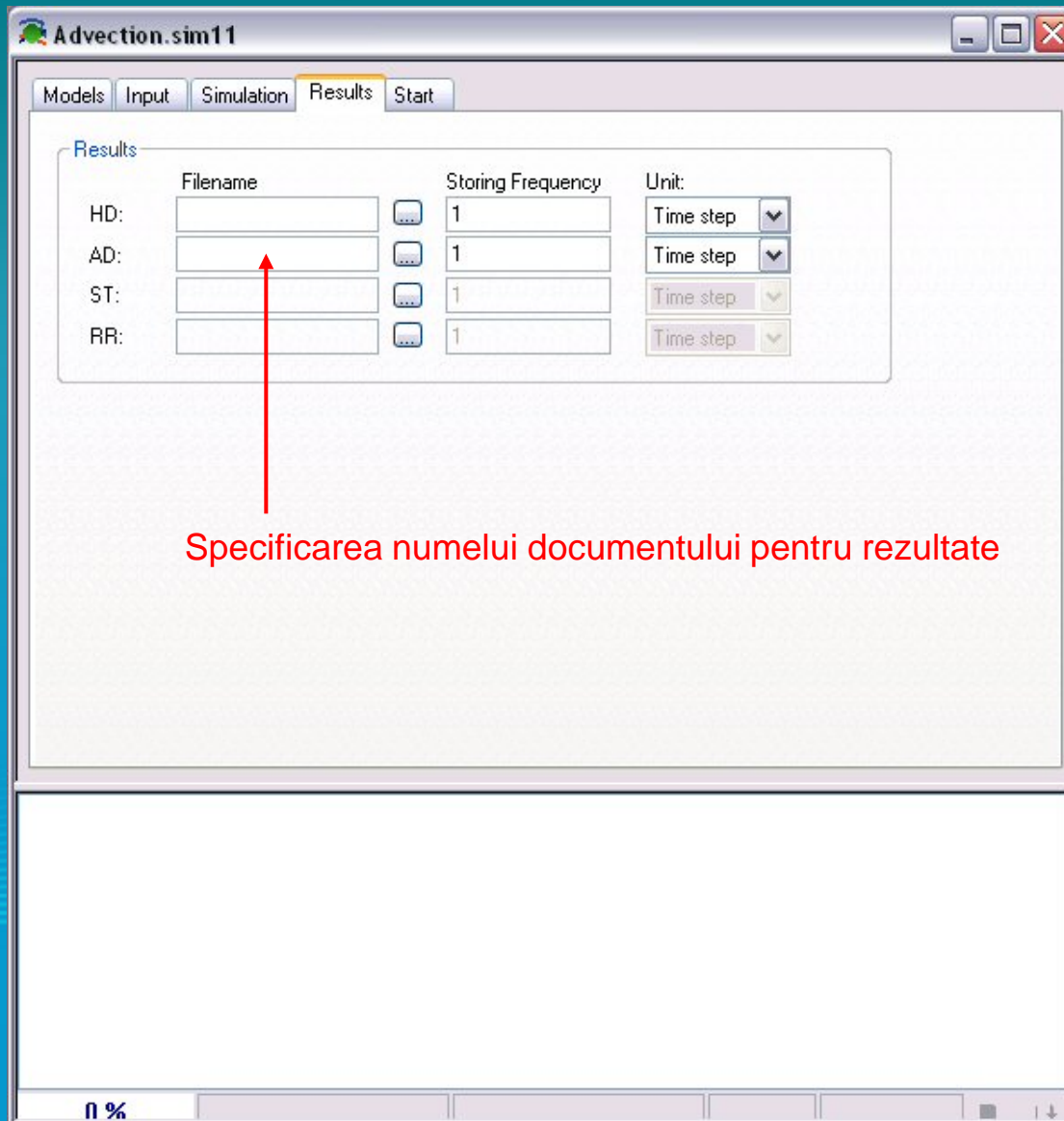
Initial Conditions

	Type of condition	Hotstart filename	Add to file	Hotstart Date and Time:
HD:	Steady State		<input type="checkbox"/>	01/01/1990 12:00:00
AD:	Parameter File		<input type="checkbox"/>	01/01/1990 12:00:00
ST:	Parameter File		<input type="checkbox"/>	01/01/1990 12:00:00
RR:	Parameter File		<input type="checkbox"/>	01/01/1990 12:00:00

0 %

Conditii de pornire pentru simularea AD

Simulation Specifications (AD-Modelling)



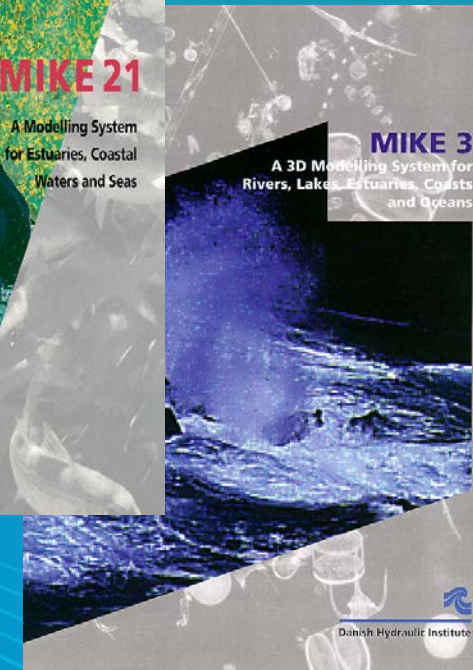
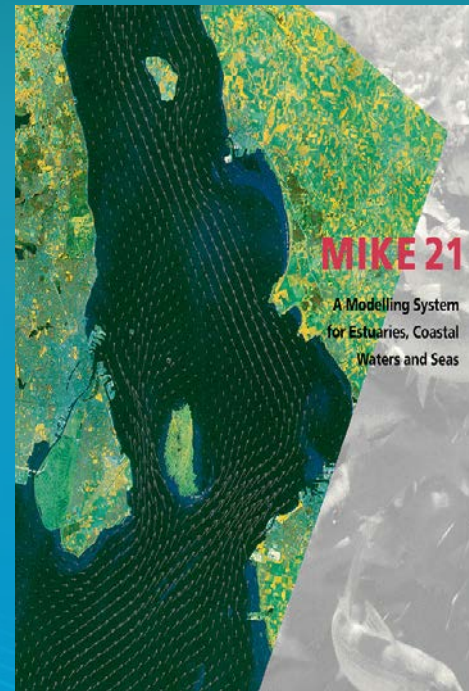


Una-, Două-, Trei – Modele de dimensionare hidrodinamica

MIKE 11

MIKE 21

MIKE 3



Descrierea WQ ECO Lab templates:

Oxigen- conditii

CBO - concentratie (dizolvat, susp., stabil)

Ammonia/Ammonium - concentratia

Nitrat – concentratie (dizolvat, particule)

Fosfor (dissolved, particule)

Temperatura apei

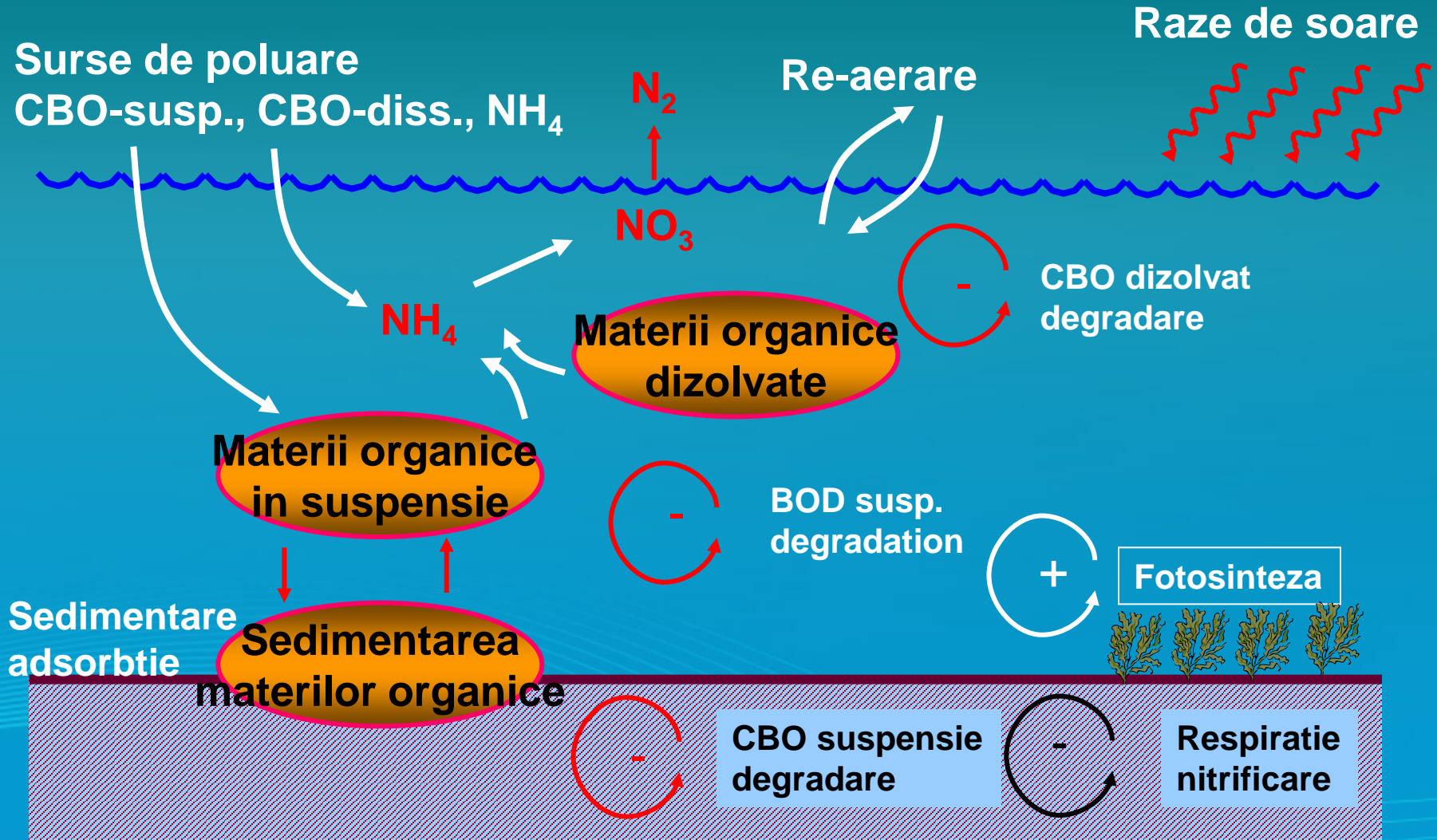
Coliforms (faecal, total)

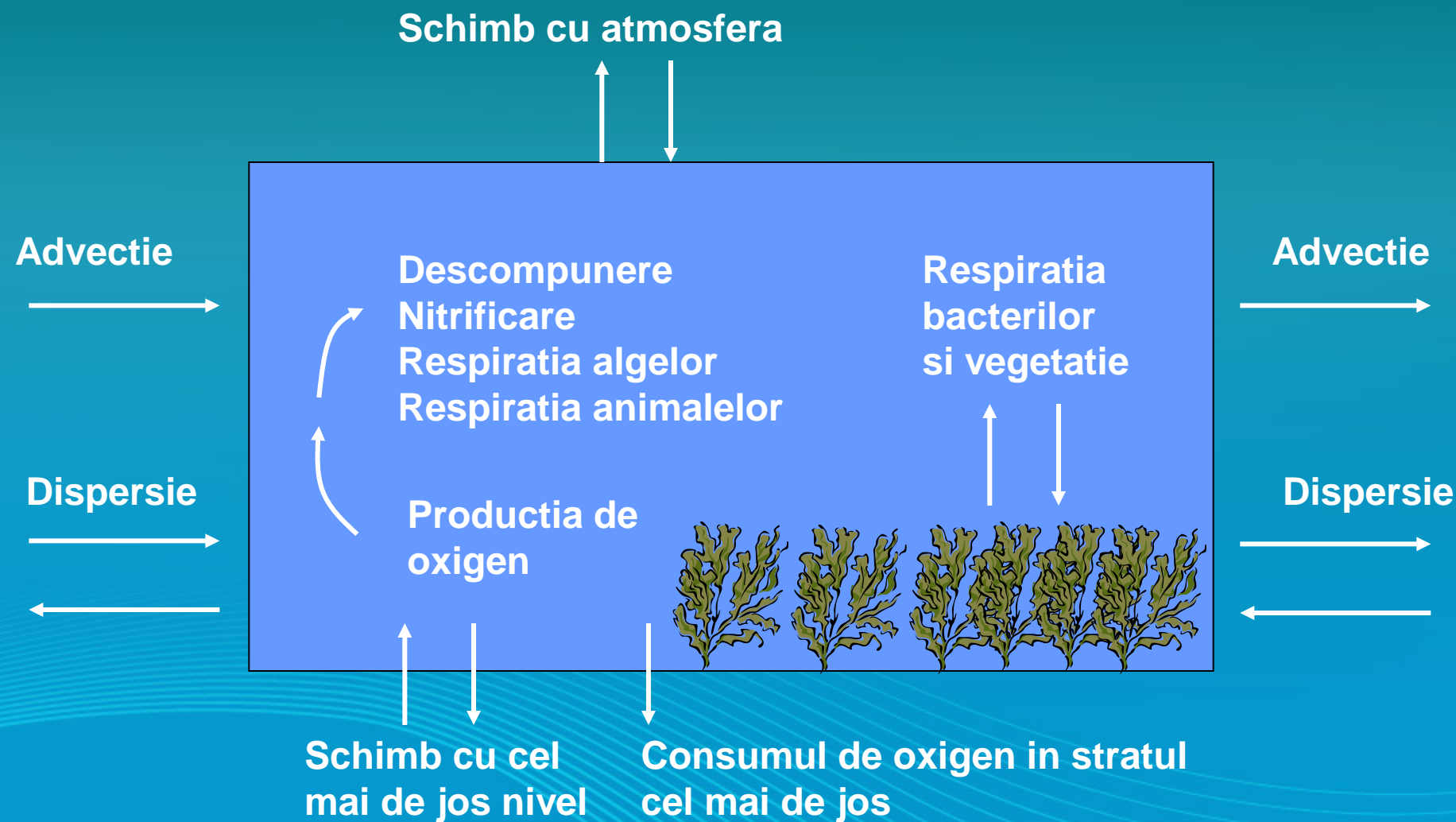
Altii poluanti

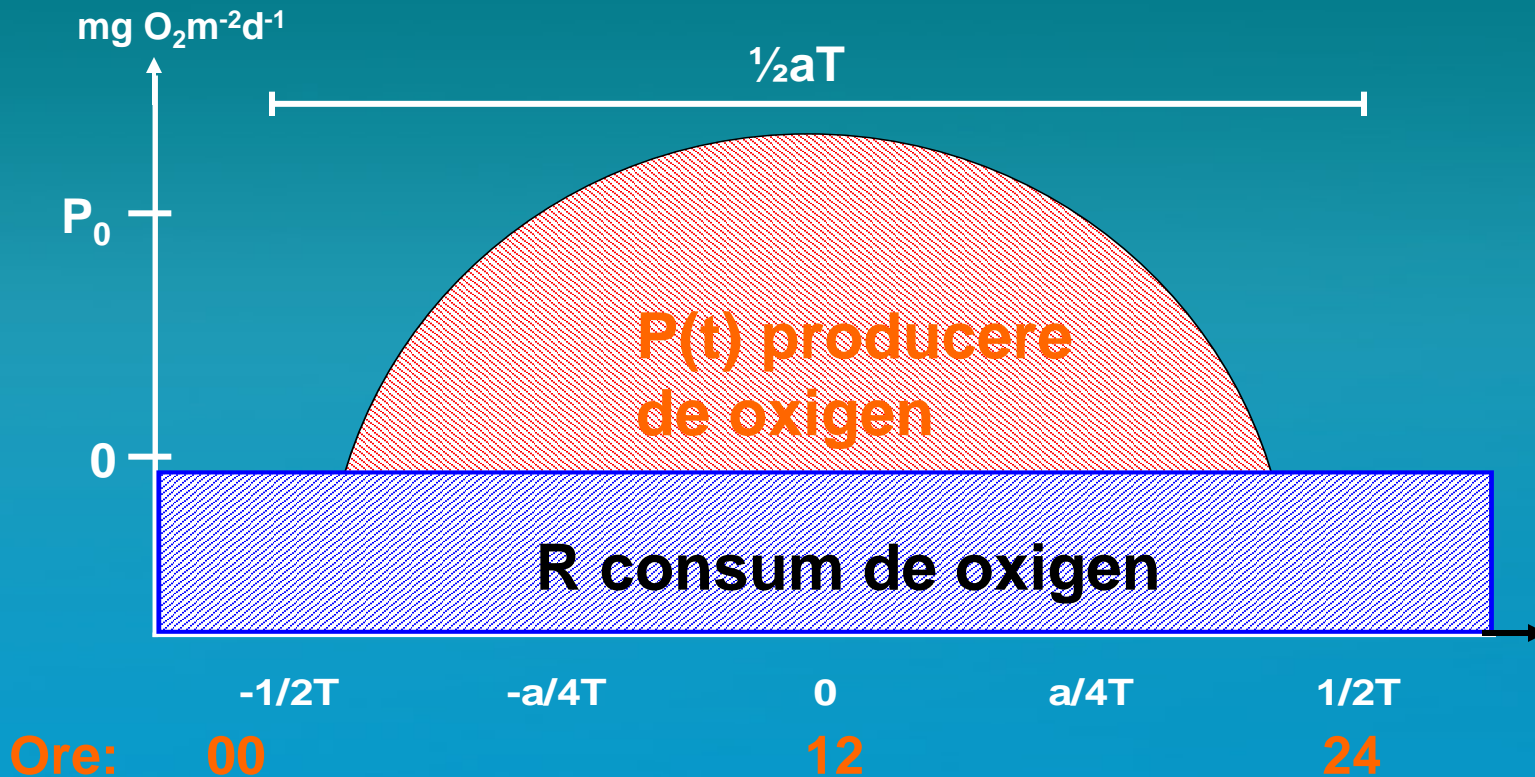
- Re-aerare
- Degradarea suspensiilor organice
- Necesitate de consum de oxigen
- Imediat & intarzierea consumului de oxigen
- Schimb cu partea inferioara / sedimente
- Nitrificare
- Denitrificare
- Procesele fosforului in apă
- Schimbul de fosfor cu sedimentele
- Bacterii coliforme

1. Temperatura
2. Oxigen
3. Ammonia
4. Nitrat
5. CBO
 - CBO dizolvat
 - CBO in suspensie
 - CBO in albie
6. Fosfor dizolvat
7. Particule de fosfor
8. Coliformi din fecale
9. Coliform total

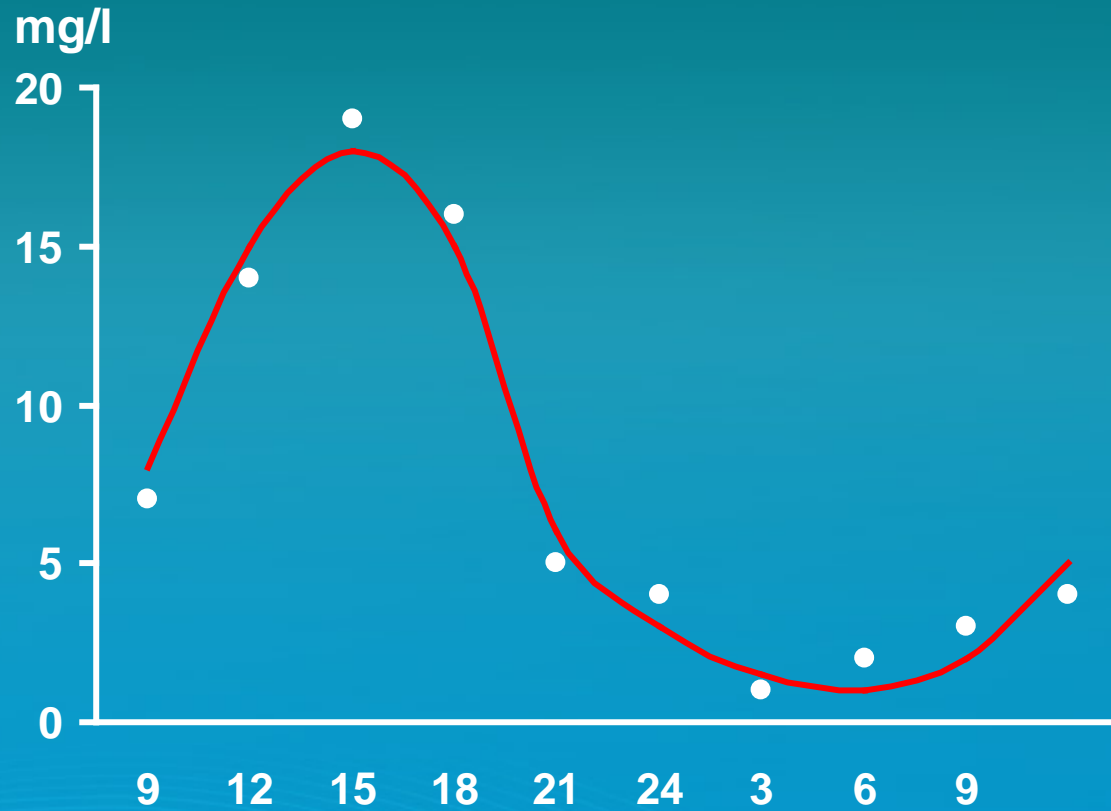
MIKE WQ – Procese de calitatea apei

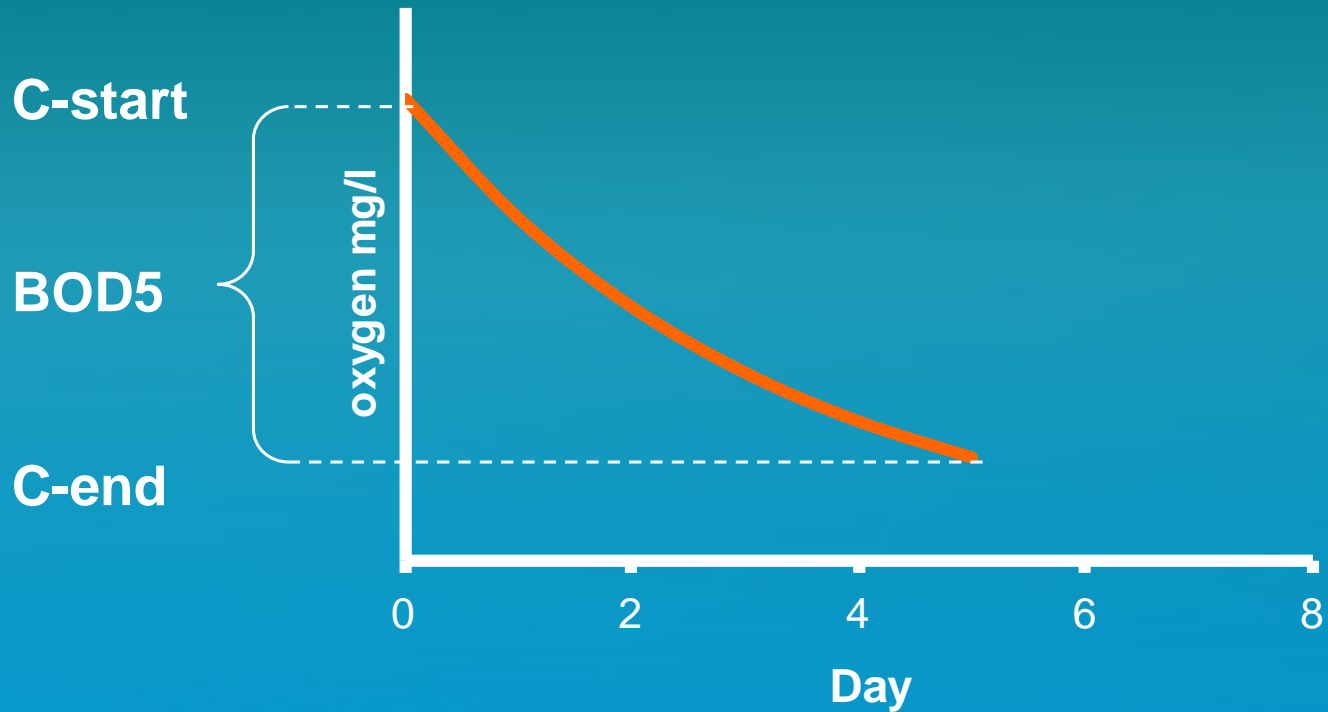




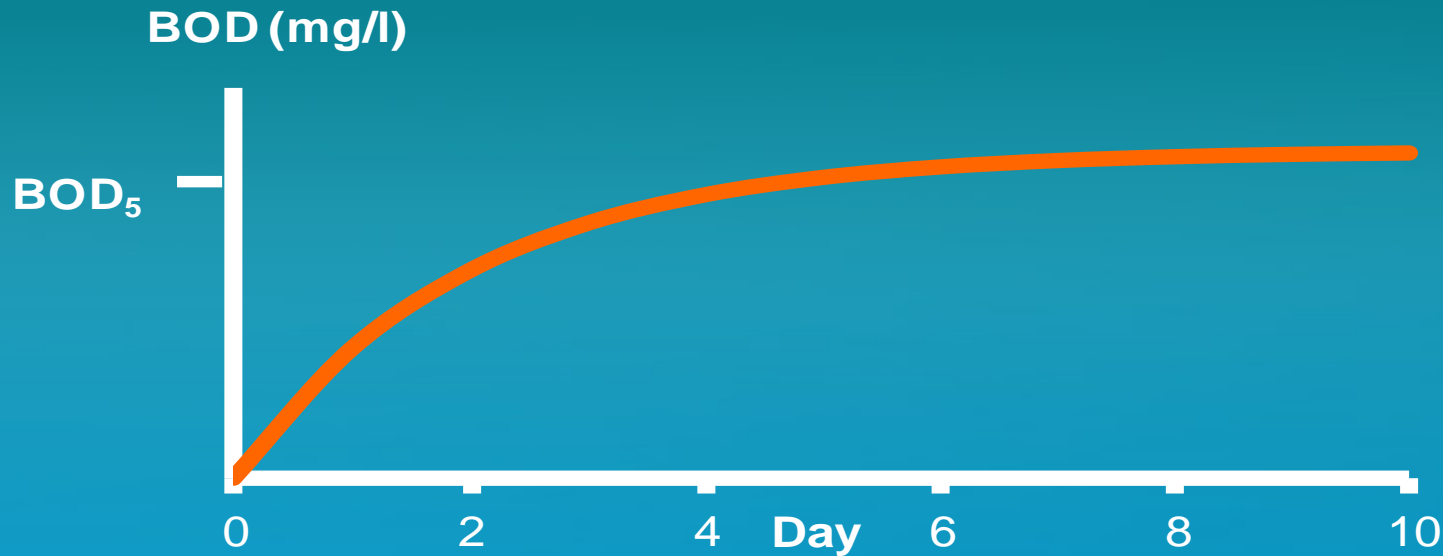


$$P\left(\frac{t}{T}\right) = \begin{cases} P_0 \cdot \cos \frac{2\pi}{a} \cdot \frac{t}{T}, & -\frac{a}{4} < \frac{t}{T} < \frac{a}{4} \\ 0, & \frac{a}{4} \leq \left| \frac{t}{T} \right| < \frac{1}{2} \end{cases}$$





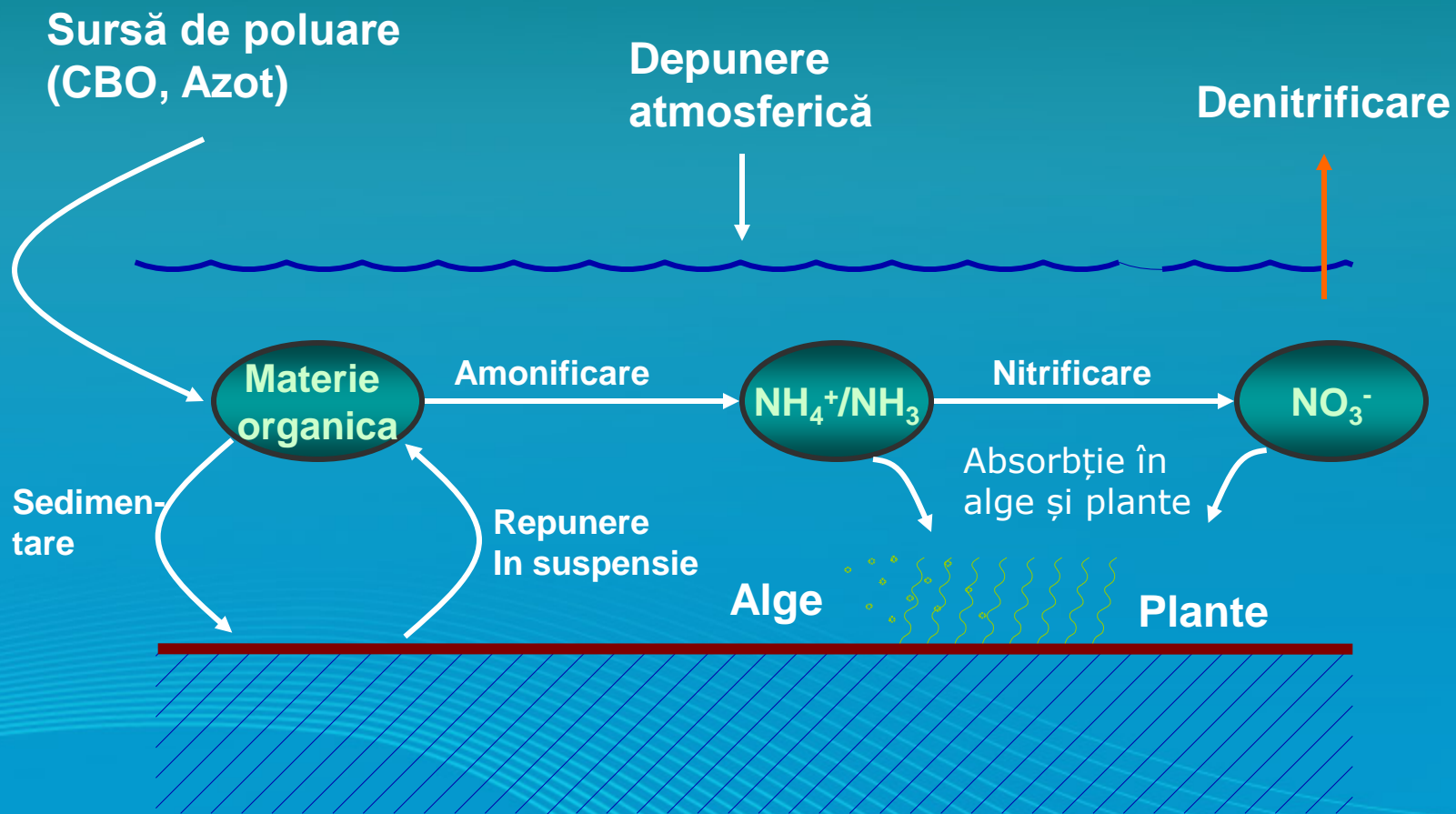
$$\frac{dC}{dt} = -k \cdot C$$

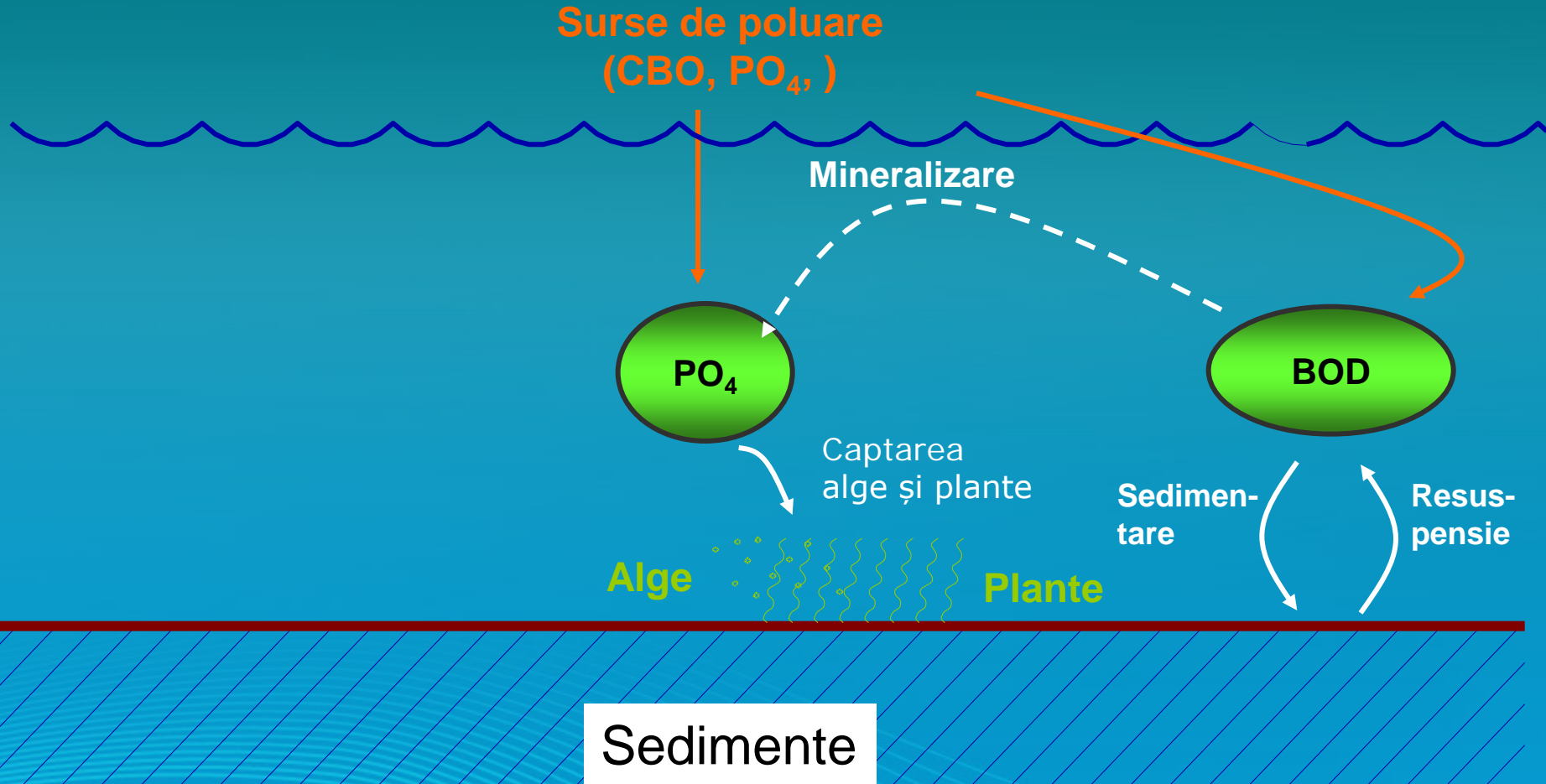


$$CBO_T = CBO_{\infty} \cdot (1 - e^{-K_{CBO} \cdot T})$$

CBO_T = CBO masurate dupa T zile

CBO_{∞} = Ultima valoare CBO





Oxigen

- Reaerare scăzută
- Respirație înaltă în timpul nopții
- degradare a materialului organic natural produs
- degradare a materialelor organice și substanțe chimice reduse din apele uzate

NH₃

- efecte toxice la valori ridicate ale pH-ului și / sau concentrații de amoniac

- Variații de oxigen afectate de respirație / fotosinteza și viteza de curgere
- Condițiile de oxigen afectate de BOD a.o. inclusiv consumul de oxigen imediate și întârziate
- Niveluri amoniacale
- Supraviețuirea coli bacterii referitoare la condiții diferite de mediu
- Evaluarea potențialelor probleme de eutrofizare legate de nivelurile de nutrienți