NATIONAL INSTITUTE OF PUBLIC HEALTH AND ENVIRONMENTAL PROTECTION
Bilthoven
The Netherlands

Report no. 739400001

RIVM Model Catalogue

F.G. Wortelboer (ed.)

March 1994

This study is conducted on behalf of and for account of the Board of Directors of the National Institute of Public Health and Environmental Protection

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Preface

This report contains a compilation of descriptions of models which are currently being used or under development at the National Institute of Public Health and Environmental Protection (RIVM), The Netherlands. A large part of the models included is developed at the RIVM itself. The models are described in a very condensed standard format. Additional information can be obtained from the persons listed as contact for the respective model.

This report has been initiated by the Intersectoral Modelling Committee (IMO) of the RIVM. In this committee all modelling groups within the RIVM are represented. At the moment, the members of this committee are: L.C. Braat (MTV), A.J. de Bruin (ISC), H.J.G.M. Derks (BFT), B.J. de Haan (CWM; chairman), E. Heina-Merkus (ACT), D.T. Jager (ECO), R.C.G.M. Smetsers (LSO), P.E. Steinberger (BKG), C.W.M. van der Maas (LAE), J.J.M. van Grinsven (LBG; secretary), J.A. van Jaarsveld (LLO), F.G. Wortelboer (LWD).

This catalogue replaces its precursor (Braat (ed.), 1992; RIVM Report no. 259102002). Its contents has been updated and the list of models has been extended. This catalogue now contains descriptions of 124 models and tools. The entry on model status has been extended by subentries for version number and the presence of Standard Operating Procedures (SOP's). As modelling efforts continue, this catalogue of models will become outdated eventually. It is the intention of the committee to update this report regularly, in response to the extents of the updates of individual models and the demand for this report.

Summary

This report contains the descriptions of the models currently used within the National Institute of Public Health and Environmental Protection (RIVM). Each model description contains the following entries: Name of the model, Contact in RIVM, Purpose, Policy theme, Technical specifications, Status, Availability, Documentation. Besides, the report contains a list of the models grouped by laboratory, a list of the models grouped by theme, and an index.

The purpose of this report is both to give an overview of the models used within the RIVM and to be of help for readers who have a specific question, in finding a model which might be of use in answering that question.

Overview of entries in the RIVM model catalogue

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	CARSMOG	20
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Models grouped by theme (continued)

Theme	Name	Laboratory	Page
Smog	CREAMOD	LLO	25
	EUROS	LLO	45
	MPA	LLO	81
Sustainable development	SimpleBox	ECO	101
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Waste & Waste removal	AQ-*	LBG	4-10
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List of full names of RIVM laboratories, centres, and bureaus

ACT	Toxicology Advisory Centre
BFT	Unit Biotransformation, Pharmaco- and Toxicokinetics
CCM	Department for Chronic Disease and Environmental Epidemiology
CWM	Centre for Mathematical Methods
ECO	Laboratory for Ecotoxicology
ISC	Information Service Centre
LAE	Laboratory for Waste and Emissions
LBG	Laboratory for Soil and Groundwater
LLO	Air Research Laboratory
LSO	Laboratory for Radiation Research
LWD	Laboratory for Water and Drinking Water Research
MTV	Environmental Forecasting Bureau

Alphabetical list of model descriptions

1. NAME OF THE MODEL : **123Radon**

2. CONTACT IN RIVM

Name : R.O. Blaauboer
Laboratory : LSO
Phone : 030-742645 Fax: 030-291604 Email: lsorob@krypton.rivm.nl

3. PURPOSE : Evaluating scenarios and trends in the average Rn-222 concentration in houses and apartments in the Netherlands due to building practices and use of building materials

4. POLICY THEME : polution of the indoor environment

5. TECHNICAL SPECIFICATIONS

Processes : infiltration from soil, exhalation from building materials,ventilation
Compartments : indoor environment, no specific living quarters
Components/compounds : Rn-222
Spatial resolution
Discretization : fixed
Dimension : 0D
Length scale : -
Application scale : local
Temporal resolution
Timestep : fixed
Calculation timestep : year
Output timestep : 1991, 2000, 2025, intermediate years possible
Input data : used building materials (Ra-226 concentration, Rn-222 emanation, diffusion)
housing stock (houses available, building rate, demolition rate, ventilation rate, amounts of materials used) per period in time
effectiveness of several possible measures
Output data : average Rn-222 concentration in the Dutch indoor living environment as a function of time up to 2025
User interface
Operation : Interactive
Communication language : Dutch
Computer code
Programming language : Lotus 1-2-3, V3.1 spreadsheet (using wysiwyg add-in)
Comment language : Dutch
Runtime : seconds on a PC-386

6. STATUS

Final working version ? : yes Version no.: 1.1
SOP : yes SOP no.: LSO/P/010
User's guide : no
Tech. ref. manual : yes, LSO/KD/0256
Application reports : yes
Under development? : no

7. AVAILABILITY

Available outside RIVM? : no
User contract mandatory? : -
Costs : -

8. DOCUMENTATION

Procedure voor het gebruik van het programma 123Radon ten behoeve van trend en reductiescenario berekeningen van Rn-222 in het binnenmilieu. SOP LSO/P/010, RIVM/LSO, Bilthoven, 1993.
Blaauboer, R.O. & R. Heling, 1993. Trends en reductiescenario's voor Rn-222-concentraties in woningen. RIVM Report no. 749231001. (LSO/KD/0256)

1. NAME OF THE MODEL : **^{90}Sr-bone**

2. CONTACT IN RIVM

Name : R.O. Blaauboer
Laboratory : LSO
Phone : 030-742645 Fax: 030-291604 Email: lsorob@krypton.rivm.nl

3. PURPOSE : Calculation of effective dose equivalent due to contamination with ^{90}Sr as a function of ^{90}Sr in diet and age of exposure.

4. POLICY THEME : Human exposure

5. TECHNICAL SPECIFICATIONS

Processes : uptake to the bone, biological degeneration
Compartments : bone
Components/compounds : ^{90}Sr
Spatial resolution
Discretization : fixed
Dimension : 0D
Length scale : not applicable
Application scale : human scale
Temporal resolution
Timestep : fixed
Calculation timestep : year
Output timestep : year
Input data : ^{90}Sr content of diet
Output data : effective dose equivalent according to age
User interface
Operation : Batch
Communication language : Dutch
Computer code
Programming language : FORTRAN 77
Comment language : Dutch
Runtime : seconds on PC-386

6. STATUS

Final working version ? : yes Version no.: 2
SOP : yes SOP no.: LSO/P/085
User's guide : no
Tech. ref. manual : yes, LSO/KD/0255
Application reports : yes
Under development? : no

7. AVAILABILITY

Available outside RIVM? : no
User contract mandatory? : -
Costs : -

8. DOCUMENTATION

Mattern, F.C.M. & L. Strackee1, 1980. Botdosisschattingen als gevolg van ingestie van ^{90}Sr middels de voeding. RIV, Memo FL/1980/8/20. (LSO/KD/0255)
Annual reports of the coordinating Committee on Radioactive and Xenobiotic Substances, secretariat RIVM, Bilthoven.

1. NAME OF THE MODEL : **AMEUR** (Ammonia Model for EURope)

2. CONTACT IN RIVM

Name	:	Petra van Egmond
Laboratory	:	MTV-MK
Phone	:	030-743816

3. PURPOSE : Calculation of past and future emissions of ammonia per country from manure, fertilizer and industrial sources in Europe. A second purpose is the calculation of the N-load of agriculture soils.

4. POLICY THEME : Acidification, eutrophication

5. TECHNICAL SPECIFICATIONS

Processes	:	Administrative model; livestock, fertilizer use, fertilizer production multiplicated by emissionfactors.
Compartments	:	air, soil
Components/compounds	:	Nitrogen, ammonia
Spatial resolution		
Discretization	:	fixed
Dimension	:	0D
Length scale	:	-
Application scale	:	national: 37 countries in europe
Temporal resolution		
Timestep	:	fixed
Calculation timestep	:	year
Output timestep	:	year
Input data	:	livestock numbers (dairy cows, sheep, pigs, laying hens, other poultry, horses, other cattle), milk yield, N-fertilizer consumption, manure production (N content) per animaltype, volatilization coefficients, stable type and penetration, application methods and penetration, application levels of chemical fertilizer.
Output data	:	Ammonia emissions per country per year, N-load of agriculture soils per country, per year.
User interface		
Operation	:	Interactive
Communication language	:	Dutch
Computer code		
Programming language	:	Lotus 1-2-3 spreadsheets
Comment language	:	Dutch
Runtime	:	problem dependent; about 5 min.

6. STATUS

Final working version ?	:	yes	Version no.: 1.0
SOP	:	no	SOP no.: -
User's guide	:	no	
Tech. ref. manual	:	no	
Application reports	:	yes	
Under development?	:	no	

7. AVAILABILITY

Available outside RIVM?	:	no
User contract mandatory?	:	-
Costs	:	-

8. DOCUMENTATION

RIVM, 1992. The Environment in Europe, a Global Perspective. RIVM Report no. 481505001. (page 74)

1. NAME OF THE MODEL : AQ-AP

2. CONTACT IN RIVM
- Name : Karel Kovar
- Laboratory : LBG
- Phone : 030-743360 Fax: 030-292897

3. PURPOSE : calculation of head drawdowns in aquifers and fluxes across aquitards, due to pumpage from one or more wells, based on analytical solution

4. POLICY THEME : drinking water production, dispersion, dessication, waste removal

5. TECHNICAL SPECIFICATIONS
- Processes : water transport
- Compartments : aquifers, aquitards
- Components/compounds : water
- Spatial resolution
  - Discretization : not applicable
  - Dimension : quasi 3D or fully 3D
  - Length scale : m, km
  - Application scale : local
- Temporal resolution
  - Timestep : variable
  - Calculation timestep : variable
  - Output timestep : variable
- Input data : aquifer transmissivity, aquitard resistance, well rates
- Output data : graphs, maps, profiles, value at selected points in space
- User interface
  - Operation : interactive
  - Communication language : English
- Computer code
  - Programming language : FORTRAN 77
  - Comment language : English
- Runtime : problem dependent; seconds to hours on 386 PC

6. STATUS
- Final working version ? : yes Version no.: 3.x
  - SOP : yes SOP no.: LBG/SOP 820
  - User's guide : yes
  - Tech. ref. manual : no
  - Application reports : no
- Under development? : no

7. AVAILABILITY
- Available outside RIVM? : yes
- User contract mandatory? : yes
- Costs : commercial price

8. DOCUMENTATION

Kovar, K. & A. Leijnse, 1988. AQ-AP, Computer Program Package for Groundwater Potential Problems Analysis (Analytical Solutions). RIVM.

1. NAME OF THE MODEL : **AQ-AS**

2. CONTACT IN RIVM

Name	:	Karel Kovar
Laboratory	:	LBG
Phone	:	030-743360 Fax: 030-292897

3. PURPOSE : calculation of pathlines and travel times in groundwater systems, both due to pumpage from wells and natural flow conditions

4. POLICY THEME : drinking water production, dispersion, dessication, waste removal

5. TECHNICAL SPECIFICATIONS

Processes	:	water transport
Compartments	:	aquifers, aquitards
Components/compounds	:	water
Spatial resolution		
Discretization	:	not applicable
Dimension	:	quasi 3D or fully 3D
Length scale	:	m, km
Application scale	:	local
Temporal resolution		
Timestep	:	variable
Calculation timestep	:	variable
Output timestep	:	variable
Input data	:	aquifer transmissivity and porosity, aquitard resistance and porosity, layer thickness, natural flow, well rates
Output data	:	plot of pathlines and travel times
User interface		
Operation	:	interactive
Communication language	:	English
Computer code		
Programming language	:	FORTRAN 77
Comment language	:	English
Runtime	:	problem dependent; seconds to hours on 386 PC

6. STATUS

Final working version ?	:	yes Version no.: 3.x
SOP	:	yes SOP no.: LBG/801
User's guide	:	yes
Tech. ref. manual	:	no
Application reports	:	no
Under development?	:	no

7. AVAILABILITY

Available outside RIVM?	:	yes
User contract mandatory?	:	yes
Costs	:	commercial price

8. DOCUMENTATION

Kovar, K. & A. Leijnse, 1988. AQ-AS, Computer Program Package for Groundwater Pathlines and Isochrones (Analytical Solutions). RIVM.

1. NAME OF THE MODEL : **AQ-AT**

2. CONTACT IN RIVM

Name : Karel Kovar
Laboratory : LBG
Phone : 030-743360 Fax: 030-292897

3. PURPOSE : Pumping test evaluation, based on analytical solution. Calculation of optimal values of geohydrological parameters from observed changes in groundwater head drawdown due to pumpage from one or more wells

4. POLICY THEME : drinking water production, dispersion, dessication, waste removal

5. TECHNICAL SPECIFICATIONS

Processes : water transport, statistical data processing
Compartments : aquifers, aquitards
Components/compounds : water
Spatial resolution
Discretization : not applicable
Dimension : quasi 3D or fully 3D
Length scale : m, km
Application scale : local
Temporal resolution
Timestep : variable
Calculation timestep : variable
Output timestep : variable
Input data : aquifer transmissivity, aquitard resistance, well rates, observed groundwater drawdowns
Output data : optimal groundwater parameter values, plot of observed and optimized groundwater heads, confidence countours
User interface
Operation : interactive
Communication language : English
Computer code
Programming language : FORTRAN 77
Comment language : English
Runtime : problem dependent; seconds to hours on 386 PC

6. STATUS

Final working version ? : yes Version no.: 3.x
SOP : yes SOP no: LBG/802
User's guide : yes
Tech. ref. manual : no
Application reports : no
Under development? : no

7. AVAILABILITY

Available outside RIVM? : yes
User contract mandatory? : yes
Costs : commercial price

8. DOCUMENTATION

Kovar, K. & A. Leijnse, 1988. AQ-AT, Computer Program Package for Pumping Test Analysis (Analytical Solutions). RIVM.

1. NAME OF THE MODEL : AQ-EC

2. CONTACT IN RIVM
- Name : Karel Kovar
- Laboratory : LBG
- Phone : 030-743360 Fax: 030-292897

3. PURPOSE : Calculation of solute concentration in a single aquifer, based on numerical solution by means of finite element method

4. POLICY THEME : drinking water production, dispersion, dessication, waste removal

5. TECHNICAL SPECIFICATIONS
- Processes : advection, dispersion, adsorption, decay
- Compartments : aquifer
- Components/compounds : water, chemical
- Spatial resolution
  - Discretization : variable
  - Dimension : 2D (horizontal or vertical)
  - Length scale : m, km
  - Application scale : local, regional
- Temporal resolution
  - Timestep : variable
  - Calculation timestep : variable
  - Output timestep : variable
- Input data : aquifer transmissivity, wells, rivers, recharge, top system drainage relation, boundary conditions (flow and solute)
- Output data : graphs, maps, profiles, results on model boundary
- User interface
  - Operation : interactive
  - Communication language : English
- Computer code
  - Programming language : FORTRAN 77
  - Comment language : English
- Runtime : problem dependent; minutes to hours on 386 PC

6. STATUS
- Final working version ? : yes Version no.: 3.x
  - SOP : yes SOP no.: LBG/807
  - User's guide : yes
  - Tech. ref. manual : no
  - Application reports : no
- Under development? : no

7. AVAILABILITY
- Available outside RIVM? : yes
- User contract mandatory? : yes
- Costs : commercial price

8. DOCUMENTATION

Kovar, K. & A. Leijnse, 1988. AQ-EC, Computer Program Package for Solute Transport Analysis (Finite Element Method). RIVM.

1. NAME OF THE MODEL : **AQ-EF**

2. CONTACT IN RIVM

Name	:	Karel Kovar
Laboratory	:	LBG
Phone	:	030-743360; Fax: 030-292897

3. PURPOSE : calculation of pathlines and travel times in quasi 3D groundwater systems, based on finite element method (package AQ-FEM must be used first)

4. POLICY THEME : drinking water production, dispersion, dessication, waste removal

5. TECHNICAL SPECIFICATIONS

Processes	:	water transport
Compartments	:	aquifers, aquitards
Components/compounds	:	water
Spatial resolution		
Discretization	:	variable
Dimension	:	quasi 3D
Length scale	:	m, km
Application scale	:	local, regional
Temporal resolution		
Timestep	:	variable
Calculation timestep	:	variable
Output timestep	:	variable
Input data	:	aquifer transmissivity and porosity, aquitard resistance and porosity, layer thickness, wells
Output data	:	plot of pathlines and travel times, plot of arrows of horizontal groundwater velocity vector field
User interface		
Operation	:	interactive
Communication language	:	English
Computer code		
Programming language	:	FORTRAN 77
Comment language	:	English
Runtime	:	problem dependent; minutes to hours 386 PC

6. STATUS

Final working version ?	:	yes	Version no.: 3.x
SOP	:	yes	SOP no.: LBG/806
User's guide	:	yes	
Tech. ref. manual	:	no	
Application reports	:	no	
Under development?	:	no	

7. AVAILABILITY

Available outside RIVM?	:	yes
User contract mandatory?	:	yes
Costs	:	commercial price

8. DOCUMENTATION

Kovar, K. & A. Leijnse, 1988. AQ-EF, Computer Program Package for Groundwater Flow Lines Analysis (Finite Element Method). RIVM.

1. NAME OF THE MODEL : **AQ-FEM**

2. CONTACT IN RIVM

Name : Karel Kovar
Laboratory : LBG
Phone : 030-743360; Fax: 030-292897

3. PURPOSE : calculation of head variation in aquifers and fluxes across aquitards, based on numerical solution by means of finite element method

4. POLICY THEME : drinking water production, dispersion, dessication, waste removal

5. TECHNICAL SPECIFICATIONS

Processes : water transport
Compartments : aquifers, aquitards
Components/compounds : water
Spatial resolution
Discretization : variable
Dimension : quasi 3D
Length scale : m, km
Application scale : local, regional
Temporal resolution
Timestep : variable
Calculation timestep : variable
Output timestep : variable
Input data : aquifer transmissivity, aquitard resistance, wells, rivers, recharge, top system drainage relation, boundary conditions
Output data : graphs, maps, profiles
User interface
Operation : interactive
Communication language : English
Computer code
Programming language : FORTRAN77
Comment language : English
Runtime : problem dependent; minutes to hours on 386 PC

6. STATUS

Final working version ? : yes Version no.: 3.x
SOP : yes SOP no.: LBG/805
User's guide : yes
Tech. ref. manual : no
Application reports : no
Under development? : no

7. AVAILABILITY

Available outside RIVM? : yes
User contract mandatory? : yes
Costs : commercial price

8. DOCUMENTATION

Kovar, K. & A. Leijnse, 1988. AQ-EG (grid generation), AQ-DD (data discretisation), AQ-EP (potential analysis, finite element method). RIVM.

1. NAME OF THE MODEL : **AQ-RE**

2. CONTACT IN RIVM

Name	:	Karel Kovar
Laboratory	:	LBG
Phone	:	030-743360; Fax: 030-292897

3. PURPOSE : One-dimensional polynomial regression analysis. Program fits (least square fit) a polynomial of order N (be selected by user) through specified observations.

4. POLICY THEME : drinking water production, dispersion, dessication, waste removal

5. TECHNICAL SPECIFICATIONS

Processes	:	polynomial regression
Compartments	:	-
Components/compounds	:	-
Spatial resolution		
Discretization	:	-
Dimension	:	-
Length scale	:	-
Application scale	:	-
Temporal resolution		
Timestep	:	-
Calculation timestep	:	-
Output timestep	:	-
Input data	:	observed parameter values
Output data	:	plot of observed and predicted parameter values, including upper and lower limit at specified confidence level
User interface		
Operation	:	interactive
Communication language	:	English
Computer code		
Programming language	:	FORTRAN77
Comment language	:	English
Runtime	:	problem dependent; seconds to minutes CPU on IBM 386

6. STATUS

Final working version ?	:	yes Version no.:
SOP	:	yes SOP no.: LBG/803
User's guide	:	yes
Tech. ref. manual	:	no
Application reports	:	no
Under development?	:	no

7. AVAILABILITY

Available outside RIVM?	:	yes
User contract mandatory?	:	yes
Costs	:	commercial price

8. DOCUMENTATION

Kovar, K. & A. Leijnse, 1988. AQ-RE, Computer Program Package for One-Dimensional Polynomial Regression Analysis. RIVM.

1. NAME OF THE MODEL : **AQ-TS**

2. CONTACT IN RIVM

Name	:	Karel Kovar
Laboratory	:	LBG
Phone	:	030-743360; Fax: 030-292897

3. PURPOSE : Time series analysis. Prediction of the future variation of a time dependent variable for which observations are available over a time period.

4. POLICY THEME : drinking water production, dispersion, dessication, waste removal

5. TECHNICAL SPECIFICATIONS

Processes	:	statistical data processing
Compartments	:	not applicable
Components/compounds	:	not applicable
Spatial resolution		
Discretization	:	not applicable
Dimension	:	not applicable
Length scale	:	not applicable
Application scale	:	not applicable
Temporal resolution		
Timestep	:	variable
Calculation timestep	:	variable
Output timestep	:	variable
Input data	:	observed parameter variation in time
Output data	:	plot of observed and predicted variation of parameter in time
User interface		
Operation	:	interactive
Communication language	:	English
Computer code		
Programming language	:	FORTRAN 77
Comment language	:	English
Runtime	:	problem dependent; seconds to minutes on 386 PC

6. STATUS

Final working version ?	:	yes	Version no.: 3.x
SOP	:	yes	SOP no.: LBG/804
User's guide	:	yes	
Tech. ref. manual	:	no	
Application reports	:	no	
Under development?	:	no	

7. AVAILABILITY

Available outside RIVM?	:	yes
User contract mandatory?	:	yes
Costs	:	commercial price

8. DOCUMENTATION

Kovar, K. & A. Leijnse, 1988. AQ-TS, Computer Program Package for Time Series Analysis. RIVM.

1. NAME OF THE MODEL : **AQUACID**

2. CONTACT IN RIVM

Name : F.G. Wortelboer
Laboratory : LWD
Phone : 030 - 743128 Fax: 030 - 252066

3. PURPOSE : Prediction of acidification and vegetation composition of shallow heathland lakes in The Netherlands

4. POLICY THEME : Acidification, Eutrophication

5. TECHNICAL SPECIFICATIONS

Processes : primary production mineralization, cation exchange, chemical equilibria, deposition
Compartments : water, sediment, macrophytes
Components/compounds : Carbon, H^+, CO_2, NH_4^+, NO_3^-, SO_4^{2-}
Spatial resolution
Discretization : fixed
Dimension : 1D
Length scale : m
Application scale : regional
Temporal resolution
Timestep : variable
Calculation timestep : controlled by error criteria on state variables
Output timestep : variable; characteristic output timestep: month or year
Input data : Physico-chemical and biochemical constants, dimension of the system, deposition data, initial concentrations
Output data : macrophyte composition, pH, alkalinity and all concentrations and process rates in water and sediment
User interface
Operation : Interactive & Batch
Communication language : English
Computer code
Programming language : FAME (Pascal or C) & ACSL
Comment language : English
Runtime : 1 min. for a 1 year simulation on PC 486

6. STATUS

Final working version ? : yes Version no.: 1.0
SOP : no SOP no.: -
User's guide : yes
Tech. ref. manual : yes
Application reports : yes
Under development? : yes

7. AVAILABILITY

Available outside RIVM? : no
User contract mandatory? : -
Costs : -

8. DOCUMENTATION

Wortelboer, F.G., 1992. AQUACID: Modelling the acidification of shallow heathland lakes in The Netherlands. The aquatic systems module of DAS. In: T. Schneider (ed), Acidification Research, Evaluation and Policy Applications, pp. 539-540. Elsevier, Amsterdam.
Wortelboer, F.G., 1993. AQUACID: Acidification model of shallow heathland lakes in The Netherlands. RIVM, in prep.

1. NAME OF THE MODEL : **ATTACK** (Analysis of Truck Traffic: Airpollution, Cargo and Kilometrage)

2. CONTACT IN RIVM

Name	:	Bert van Wee
Laboratory	:	MTV
Phone	:	030-743654 Fax: 030-250740

3. PURPOSE : Forecasting energy use and emissions of trucks and vans

4. POLICY THEME : Climate change, acidification, disturbance

5. TECHNICAL SPECIFICATIONS

Processes	:	transport demand by economic sector; emissions and energy use by trucks and vans
Compartments	:	air
Components/compounds	:	economic sectors, vehicles
Spatial resolution		
Discretization	:	fixed
Dimension	:	0D
Length scale	:	-
Application scale	:	national
Temporal resolution		
Timestep	:	year
Calculation timestep	:	year
Output timestep	:	- (preset output times: 2000, 2015)
Input data	:	sectoral economic growth, logistic parameters, parameters of emissions per component, parameters of fuel consumption per vehicle type
Output data	:	number of vehicles per type, vehicle use, emissions of NO_x, VOC, CO_2, CO, particulates, SO_2, energy use
User interface		
Operation	:	interactive
Communication language	:	Dutch
Computer code		
Programming language	:	spreadsheet
Comment language	:	English
Runtime	:	problem and machine dependent: up to 15 min. on 386 PC

6. STATUS

Final working version ?	:	yes Version no.: -
SOP	:	no SOP no.: -
User's guide	:	yes
Tech. ref. manual	:	yes
Application reports	:	yes
Under development?	:	no

7. AVAILABILITY

Available outside RIVM?	:	yes, developed at NEI, Rotterdam, The Netherlands
User contract mandatory?	:	-
Costs	:	-

8. DOCUMENTATION

Uittenbogaart, P.J, 1992. ATTACK: Een interactief computer-simulatiemodel voor het bedrijfsvoertuigenpark. Technische specificatie; Gebruikershandleiding bij softwarepakket. Nederlands Economisch Instituut (NEI), Rotterdam.

Uittenbogaart, P.J, 1993. ATTACK: Een interactief computer-simulatiemodel voor het bedrijfsvoertuigenpark. Functionele specificatie. Nederlands Economisch Instituut (NEI), Rotterdam.

1. NAME OF THE MODEL : **BILTH** (BILTHoven cow-model)

2. CONTACT IN RIVM

Name : R.O. Blaauboer
Laboratory : LSO
Phone : 030-742645 Fax: 030-291604 Email: lsorob@krypton.rivm.nl

3. PURPOSE : Compartmental model for calculation of the day by day resulting concentrations of radionuclides in the air-pasture-cow-milk/meat pathway during a nuclear incident

4. POLICY THEME : Nuclear accident management; especially influence of grazing bans

5. TECHNICAL SPECIFICATIONS

Processes : contamination of pasture, milk, meat
Compartments : air (local), pasture, cow
Components/compounds : Radioactive material (used for ^{131}I, and ^{137}s)
Spatial resolution
Discretization : fixed
Dimension : 0D
Length scale : not applicable
Application scale : local
Temporal resolution
Timestep : fixed
Calculation timestep : day
Output timestep : day and/or time-integrated
Input data : Rainfall (per day), concentration in air (per day), several parameter values like interception, weathering time, pasture consumption rate, transfer factors
Output data : Concentrations of radionuclide considered in pasture, deposition, milk, meat and corresponding uncertainty and/or sensitivity analyses
User interface
Operation : Interactive & Batch: both possible
Communication language : English
Computer code
Programming language : Borland Turbo Pascal 4.0
Comment language : English
Runtime : Depending on number of iterations: sec.-min. on a PC-386

6. STATUS

Final working version ? : yes Version no.: 2.0
SOP : yes SOP no.: LSO/MOP/009
User's guide : yes
Tech. ref. manual : no
Application reports : yes
Under development? : no

7. AVAILABILITY

Available outside RIVM? : no
User contract mandatory? : -
Costs : -

8. DOCUMENTATION

BIOMOVS Technical Report No.13 (parts 1 and 2). Scenario A4, Multiple model testing using Chernobyl fallout data of I-131 in forage and milk and Cs-137 in forage, milk beef and grain. NIRP, Stockholm.
BILTH: Een stralingsbelasting-model voor de besmettingsroute lucht-gras-koe-melk. Berichten uit het RIVM 1987, pp.312-314, Bilthoven, 1988.

1. NAME OF THE MODEL : **BIOME**

2. CONTACT IN RIVM

Name : R. Leemans
Laboratory : MTV/LBG
Phone : 030-743377 Fax: 030-292897 Email: mobirik@rivm.nl

3. PURPOSE : The BIOME model simulates the distribution of global vegetation patterns (biomes) by determining the availability of plant functional types with respect to climatic indices.

4. POLICY THEME : Climate Change

5. TECHNICAL SPECIFICATIONS

Processes : Plant distribution
Compartments : Plant Functional Types
Components/compounds :
Spatial resolution
Discretization : variable (Default is 0.5o longitude and latitude)
Dimension : 2D
Length scale : 0.5 o longitude and latitude
Application scale : global
Temporal resolution
Timestep :
Calculation timestep :
Output timestep :
Input data : Soil moisture Holding Capacity and Monthly data on temperature, precipitation and cloudiness.
Output data : Distribution of plant functional types
User interface
Operation : Batch
Communication language :
Computer code
Programming language : FORTRAN 77
Comment language :
Runtime :

6. STATUS

Final working version ? : yes Version no.: -
SOP : no SOP no.: -
User's guide : no
Tech. ref. manual : yes
Application reports : yes
Under development? : yes

7. AVAILABILITY

Available outside RIVM? : yes
User contract mandatory? : no
Costs : handling costs

8. DOCUMENTATION

Leemans, R., 1992. Modelling ecological and agricultural impacts of global change on a global scale. Journal of Scientific and Industrial Research 51, 709-724.

Prentice, I.C., W. Cramer, S.P. Harrison, R. Leemans, R.A. Monserud & A.M. Solomon, 1992. A global biome model based on plant physiology and dominance, soil properties and climate. Journal of Biogeography 19, 117-134.

1. NAME OF THE MODEL : **BOSDA**

2. CONTACT IN RIVM

Name	:	F.J. Kragt
Laboratory	:	LWD
Phone	:	030-743014 Fax: 030-252066

3. PURPOSE : Decision support by means of multi-criteria evaluation

4. POLICY THEME : all

5. TECHNICAL SPECIFICATIONS

Processes	:	Decision support based on criteria, alternatives, effects of alternatives for the criteria and weight factors for the criteria
Compartments	:	-
Components/compounds	:	
Spatial resolution		
Discretization	:	-
Dimension	:	0D
Length scale	:	-
Application scale	:	-
Temporal resolution		
Timestep	:	-
Calculation timestep	:	-
Output timestep	:	-
Input data	:	alternatives, criteria, effects/scores of alternatives per criterium, weight factors per criterium
Output data	:	ranking of alternatives, including sensitivities of ranking to uncertainties in the predicted effects
User interface		
Operation	:	Interactive
Communication language	:	Dutch
Computer code		
Programming language	:	Turbo Pascal
Comment language	:	-
Runtime	:	seconds

6. STATUS

Final working version ?	:	yes Version no.: -
SOP	:	no SOP no.: -
User's guide	:	yes
Tech. ref. manual	:	yes
Application reports	:	yes
Under development?	:	no

7. AVAILABILITY

Available outside RIVM?	:	yes, model developed at IvM, Amsterdam
User contract mandatory?	:	-
Costs	:	contact IvM.

8. DOCUMENTATION

Janssen, R. & M. van Herwijnen, 1992. Beslissingsondersteunend systeem voor discrete alternatieven (BOSDA). Systeembeschrijving en handleiding. IvM, Amsterdam.

1. NAME OF THE MODEL : **BUDYKO**

2. CONTACT IN RIVM

Name : R. Leemans
Laboratory : MTV/LBG
Phone : 030-743377 Fax: 030-292897 Email: mobirik@rivm.nl

3. PURPOSE : The Budyko model is a climate classification, which can be used to delimit global vegetation zones. The model is used to simulate changes in extent on a global scale.

4. POLICY THEME : Climate Change

5. TECHNICAL SPECIFICATIONS

Processes : Climate_vegetation interactions
Compartments : Biomes
Components/compounds : n.a.
Spatial resolution
Discretization : variable (Default is 0.5o longitude and latitude)
Dimension : 2D
Length scale : 0.5o longitude and latitude
Application scale : continental / global
Temporal resolution
Timestep : n.a.
Calculation timestep : n.a.
Output timestep : n.a
Input data : Monthly average temperature, precipitation, cloudiness, vapour pressure and albedo data
Output data : Biomes
User interface
Operation : Batch
Communication language : English
Computer code
Programming language : FORTRAN 77
Comment language : English
Runtime : 15 minutes for a global application on a SUN-IPC workstation

6. STATUS

Final working version ? : yes Version no.:
SOP : no SOP no.:
User's guide : no
Tech. ref. manual : yes
Application reports : yes
Under development? : no

7. AVAILABILITY

Available outside RIVM? : yes
User contract mandatory? : no
Costs : handling costs

8. DOCUMENTATION :

Budyko, M.I., 1974. Climate and Life. Academic Press, New York.
Tchebakova, N. , R.A. Monserud, S. Golovanov & R. leemans, 1993. A global vegetation model based on the climatological approach of Budyko. Journal of Biogeography, in press.
Tchebakova, N., R.A. Monserud & R. Leemans, 1993. Global vegetation change predicted by the modified Budyko model. Climatic Change, in press.

1. NAME OF THE MODEL : **CAR**

2. CONTACT IN RIVM

Name	:	Hans Eerens
Laboratory	:	LLO
Phone	:	030-743012 Fax: 030-287531

3. PURPOSE : model for estimation of yearly average and percentile concentrations including NO2 chemistry in cities (kerbsites) resulting from traffic emissions. Total traffic emissions are estimated from traffic intensity (number and type of vehicles passing per day), driving speed and emission factor for each vehicle type.

4. POLICY THEME : dispersion

5. TECHNICAL SPECIFICATIONS

Processes	:	atmospheric transport and dispersion
Compartments	:	single box
Components/compounds	:	CO, NO_2, benzene, black smoke, in general all chemically less reactive species which are predominantly emitted by traffic
Spatial resolution		
Discretization	:	fixed
Dimension	:	1D
Length scale	:	up to several tens of meters from street centerline
Application scale	:	local
Temporal resolution		
Timestep	:	fixed
Calculation timestep	:	year
Output timestep	:	year
Input data	:	yearly averaged meteorology; background concen-trations; street type; traffic intensity, speed and composition
Output data	:	yearly averaged concentration; 98 percentile values
User interface		
Operation	:	Interactive
Communication language	:	Dutch and English
Computer code		
Programming language	:	Pascal, Clipper
Comment language	:	Dutch as well as English
Runtime	:	small

6. STATUS

Final working version ?	:	yes	Version no.: 1.2
SOP	:	no	SOP no.: -
User's guide	:	yes	
Tech. ref. manual	:	yes	
Application reports	:	yes	
Under development?	:	no	

7. AVAILABILITY

Available outside RIVM?	:	yes
User contract mandatory?	:	no
Costs	:	-

8. DOCUMENTATION

Eerens, H.C., 1989. CAR: a calculation of air pollution from road traffic model. RIVM Report no. 228475017.

1. NAME OF THE MODEL : CARMEN

2. CONTACT IN RIVM
- Name : B.J. de Haan
- Laboratory : CWM
- Phone : 030-743080

3. PURPOSE : Scoping of environmental policy scenarios, scenario-analysis, environmental, public health and economic impact assessement.

4. POLICY THEME : in principle: all

5. TECHNICAL SPECIFICATIONS
- Processes : economic activity (agriculture, transport, energy production), emissions, resource use, transport & conversion of compounds, ecological dynamics.
- Compartments : economic/technical, air, soil, groundwater, surface water, forest, heathland, wetlands, aquatic communities, agro-ecosystem, human population
- Components/compounds : currently: compounds relevant to acidification theme
- Spatial resolution
  - Discretization : fixed
  - Dimension : 2D
  - Length scale : km
  - Application scale : continental: regionalized Europe
- Temporal resolution
  - Timestep : fixed
  - Calculation timestep : 1 year
  - Output timestep : 1 year
- Input data : economic growth, technical measures, emissions, environmental standards, unit costs, compartment parameters.
- Output data : economic, ecological, environmental indicators
- User interface
  - Operation : Interactive
  - Communication language : English
- Computer code
  - Programming language : MatLab
  - Comment language : English
- Runtime :

6. STATUS
- Final working version ? : no Version no.: -
  - SOP : no SOP no.: -
  - User's guide : no
  - Tech. ref. manual : no
  - Application reports : no
- Under development? : yes

7. AVAILABILITY
- Available outside RIVM? : no
- User contract mandatory? : -
- Costs : -

8. DOCUMENTATION
None

1. NAME OF THE MODEL : **CARSMOG**

2. CONTACT IN RIVM

Name	:	Michiel van den Anker
Laboratory	:	LLO
Phone	:	030-742509 Fax: 030-287531

3. PURPOSE : model for the estimation of hourly concentrations of air pollutants in city streets due to automotive exhaust.

4. POLICY THEME : dispersion

5. TECHNICAL SPECIFICATIONS

Processes	:	Atmospheric transport and dispersion. Concentrations are calculated from traffic and geometric data in cities by extrapolation of on-line measurements on street, background and wind stations.
Compartments	:	single box
Components/compounds	:	CO, NO_2, NO_x
Spatial resolution		
Discretization	:	fixed
Dimension	:	1D
Length scale	:	up to several tens of meters from street centerline
Application scale	:	local
Temporal resolution		
Timestep	:	fixed
Calculation timestep	:	hour
Output timestep	:	hour
Input data	:	on-line measurements of concentrations in city streets and on background stations, wind speed and wind direction on regional stations, mean traffic intensity, geometry of city streets
Output data	:	1 hour concentrations of CO, NO_x and NO_2
User interface		
Operation	:	Batch
Communication language	:	Dutch
Computer code		
Programming language	:	C
Comment language	:	Dutch
Runtime	:	small

6. STATUS

Final working version ?	:	yes	Version no.: 1.0
SOP	:	no	SOP no.: -
User's guide	:	no	
Tech. ref. manual	:	yes	
Application reports	:	yes	
Under development?	:	no	

7. AVAILABILITY

Available outside RIVM?	:	no
User contract mandatory?	:	-
Costs	:	-

8. DOCUMENTATION

Den Tonkelaar, W.A.M. & H. Wildschut, 1993. Ontwikkeling van CARSMOG: Een systeem voor het on-line berekenen van het luchtverontreinigingsniveau in stadstraten door middel van extrapolatie van metingen in andere straten. IMW-TNO, Delft, Rapport 93/084.

1. NAME OF THE MODEL : **CATS-1**

2. CONTACT IN RIVM

Name	:	T. Traas, T. Aldenberg
Laboratory	:	LWD
Phone	:	030-742609 Fax: 030-252066

3. PURPOSE : Prediction of Cadmium-accumulation in meadows, both biotic and abiotic, on different soil types

4. POLICY THEME : risk assessment, fate of chemicals

5. TECHNICAL SPECIFICATIONS

Processes	:	Assimilation, uptake, respiration, excretion, mortality, predation, sedimentation, resuspension, mineralization, sorption, leaching
Compartments	:	soil, litter, vegetation, soil fauna, herbivores, predators
Components/compounds	:	dryweight, cadmium
Spatial resolution		
Discretization	:	fixed
Dimension	:	1D
Length scale	:	cm
Application scale	:	regional
Temporal resolution		
Timestep	:	variable
Calculation timestep	:	year
Output timestep	:	year
Input data	:	starting values for biomass of biota and concentrations, cadmium loading, soil characteristics
Output data	:	concentrations in all compartments, biomass of biota, bio-concentration factors
User interface		
Operation	:	Interactive
Communication language	:	English
Computer code		
Programming language	:	ACSL
Comment language	:	English
Runtime	:	1 min. for 25 year simulation on a 486 PC

6. STATUS

Final working version ?	:	yes Version no.: 2.31
SOP	:	no SOP no.: -
User's guide	:	no
Tech. ref. manual	:	yes
Application reports	:	no
Under development?	:	yes

7. AVAILABILITY

Available outside RIVM?	:	no
User contract mandatory?	:	-
Costs	:	-

8. DOCUMENTATION

Traas, T.P. & T. Aldenberg, 1992. CATS-1: a model for predicting contaminant accumulation in a meadow ecosystem. The case of cadmium. RIVM Report no. 719103001.

1. NAME OF THE MODEL : **CATS-2**

2. CONTACT IN RIVM

Name	:	T. Traas, T. Aldenberg
Laboratory	:	LWD
Phone	:	030-742609 Fax: 030-252066

3. PURPOSE : Prediction of toxicant accumulation in ecosystems in sedimentation areas of the Dutch Delta area, both in biotic and abiotic compartments

4. POLICY THEME : risk assessment, dispersion

5. TECHNICAL SPECIFICATIONS

Processes	:	Assimilation, uptake, respiration, excretion, mortality, predation, sedimentation, resuspension, mineralization, sorption
Compartments	:	water, sediment, biota in foodweb (phytoplankton, zooplankton, herbivorous fish, predatory fish, detritivorous and omnivorous benthic fauna, clams, benthivorous birds, piscivorous birds)
Components/compounds	:	dryweight, toxicant (cadmium, lindane, etc.)
Spatial resolution		
Discretization	:	fixed
Dimension	:	1D
Length scale	:	m
Application scale	:	regional
Temporal resolution		
Timestep	:	variable
Calculation timestep	:	year
Output timestep	:	year
Input data	:	starting values for biomass of biota and concentrations, loading of respective chemical, water characteristics
Output data	:	concentrations in all compartments, biomass of biota, bio-concentration factors
User interface		
Operation	:	Interactive
Communication language	:	English
Computer code		
Programming language	:	ACSL
Comment language	:	English
Runtime	:	1 min. for a 25 year simulation on a 486 PC

6. STATUS

Final working version ?	:	yes	Version no.: 3.0
SOP	:	no	SOP no.: -
User's guide	:	no	
Tech. ref. manual	:	no	
Application reports	:	no	
Under development?	:	yes	

7. AVAILABILITY

Available outside RIVM?	:	no
User contract mandatory?	:	-
Costs	:	-

8. DOCUMENTATION

Traas, T.P., P.R.G. Kramer, T. Aldenberg & M.J. 't Hart, 1993. Prediction of toxicant accumulation in sedimentation areas of the Dutch Delta Region. RIVM Report no. 739103001, in prep.

1. NAME OF THE MODEL : **CLEAN**

2. CONTACT IN RIVM

Name : K.F de Boer
Laboratory : MTV
Phone : 030-743530 Fax: 030-250740 Email: mtvfb@rivm.nl

3. PURPOSE : Calculation of NH_3 emissions, N, P and K loads from manure.

4. POLICY THEME : Eutrophication

5. TECHNICAL SPECIFICATIONS

Processes : NH_3 emissions, manure production, distribution & application
Compartments : air, soil
Components/compounds : Manure, NH_3 , N, P, K
Spatial resolution
Discretization : variable
Dimension : 2D
Length scale : variable, depends on data
Application scale : local, regional (data dependent)
Temporal resolution
Timestep : -
Calculation timestep : immediate
Output timestep : Identical to input
Input data : # animals, crop area, excretion coefficient, stable technology
Output data : N, P, K load per crop per region, NH_3 emission per source per region
User interface
Operation : Input via database interactive; run batch
Communication language : English/dutch
Computer code
Programming language : C++ & Ingres-Windows 4GL
Comment language : English
Runtime : for one year for 31 regions 2 min. on a UNIX system.

6. STATUS

Final working version ? : no Version no.: -
SOP : no SOP no.: -
User's guide : no
Tech. ref. manual : yes
Application reports : no
Under development? : yes

7. AVAILABILITY

Available outside RIVM? :
User contract mandatory? :
Costs :

8. DOCUMENTATION

Mooren, M.A.M. & N.J.P. Hoogervorst, 1993. CLEAN, het RIVM-landbouwmodel. Deel 1: modelstructuur, versie 1.0. RIVM Report no. 259102004

1. NAME OF THE MODEL : **CONTOUR**

2. CONTACT IN RIVM

Name : E.J.M. Veling
Laboratory : CWM
Phone : 030-742072 Fax: 030-250740 Email: cwmedve@rivm

3. PURPOSE : CONTOUR calculates groundwater potentials. Treats a half-infinite deep aquifer with a natural groundwater flow, infiltration, partial well screens and drains. Can also be used with FLOPZ1 and FLOPZN.

4. POLICY THEME : Acidification, desiccation, eutrophication

5. TECHNICAL SPECIFICATIONS

Processes : Solution of Laplace equation for determination of the groundwater potential.
Compartments : Groundwater.
Components/compounds : Aquifers and/or aquitards
Spatial resolution
Discretization : continuous
Dimension : 3D, the vertical dimension is approximative
Length scale : 10 - 5000 m
Application scale : local/regional
Temporal resolution
Timestep : stationary solution
Calculation timestep : -
Output timestep : -
Input data : Strength a natural groundwater flow; strength infiltration; location and strength partial well screens; location and strength drains.
Output data : Graphical presentation of groundwater potential as contour plots.
User interface
Operation : interactive & batch
Communication language : English
Computer code
Programming language : FORTRAN 77
Comment language : English
Runtime : About 0.5-1 min. for a more complex problem on a 386PC

6. STATUS

Final working version ? : yes Version no.: 2.0 (4-1-'91)
SOP : no SOP no.: -
User's guide : yes
Tech. ref. manual : no
Application reports : yes
Under development? : no

7. AVAILABILITY

Available outside RIVM? : yes
User contract mandatory? : yes
Costs : commercial price

8. DOCUMENTATION

Veling, E.J.M., 1991. CONTOUR, A computer program to draw isohypse patterns. RIVM, Internal Memorandum, version 2.
Beugelink, G.P. & J.H.C. Mülschlegel, 1989. Winning van freatisch grondwater in Nederland; hoe lang nog? H_2O 22, 590-594.

1. NAME OF THE MODEL : **CREAMOD**

2. CONTACT IN RIVM

Name	:	Erik Noordijk
Laboratory	:	LLO
Phone	:	030-743012 Fax: 030-287531

3. PURPOSE : CREAMOD assists in the definition, creation and usage of models which predict air quality in the coming hours or days. The basis of the models consists of statistical relations between meteorological measurements of KNMI and RIVM and the related concentrations of air polluting compounds, as measured by the Dutch National Air Quality Monitoring Network.

4. POLICY THEME : dispersion, summer/winter smog

5. TECHNICAL SPECIFICATIONS

Processes	:	statistical handling of network data
Compartments	:	atmospheric boundary layer
Components/compounds	:	in principle all compounds which are measured by the National Air Quality Monitoring Network
Spatial resolution		
Discretization	:	fixed: location of measuring stations
Dimension	:	0D
Length scale	:	the same spatial resolution as the measurements of the National Air Quality Monitoring Network for the compound
Application scale	:	regional
Temporal resolution		
Timestep	:	variable: the time resolution can be one hour or one day
Calculation timestep	:	
Output timestep	:	
Input data	:	a meteorological prognosis and measurements of the last hours of the compound
Output data	:	a prognosis of concentrations on the monitoring stations of the National Air Quality Monitoring Network
User interface		
Operation	:	Interactive
Communication language	:	Dutch
Computer code		
Programming language	:	FORTRAN
Comment language	:	Dutch
Runtime	:	small, less than one minute

6. STATUS

Final working version ?	:	yes Version no.: -
SOP	:	no SOP no.: -
User's guide	:	yes
Tech. ref. manual	:	yes
Application reports	:	yes
Under development?	:	no

7. AVAILABILITY

Available outside RIVM?	:	no
User contract mandatory?	:	-
Costs	:	-

8. DOCUMENTATION

Noordijk, E., 1991. CREAMOD. Technical documentation. RIVM, internal report, draft.

1. NAME OF THE MODEL : **CRITLO**

2. CONTACT IN RIVM

Name	:	J.-P. Hettelingh
Laboratory	:	MTV
Phone	:	030 - 743048

3. PURPOSE : Computation of critical loads for acidity, sulphur and nitrogen. Related to RAINS.

4. POLICY THEME : acidification

5. TECHNICAL SPECIFICATIONS

Processes	:	Steady State Mass Balance of soil and water chemistry
Compartments	:	forest-soils, surface water
Components/compounds	:	acidic
Spatial resolution		
Discretization	:	variable
Dimension	:	2D
Length scale	:	gridded (150x150 km^2) and $1^{\circ}x0.5^{\circ}$
Application scale	:	regional/continental
Temporal resolution		
Timestep	:	steady state
Calculation timestep	:	n.a
Output timestep	:	n.a.
Input data	:	forest landuse, soil/water chemistry
Output data	:	Critical loads in eq/ha yr
User interface		
Operation	:	Interactive
Communication language	:	English
Computer code		
Programming language	:	DBASE, DBSPANS
Comment language	:	English
Runtime	:	couple of real minutes

6. STATUS

Final working version ?	:	no Version no.: -
SOP	:	no SOP no.: -
User's guide	:	no
Tech. ref. manual	:	no
Application reports	:	yes
Under development?	:	yes, in connection with RIVM GIS

7. AVAILABILITY

Available outside RIVM?	:	yes for SPANS and GEOMAN users
User contract mandatory?	:	no
Costs	:	handling costs

8. DOCUMENTATION

Hettelingh, J.-P., R.J. Downing & P.A.M. de Smet (eds), 1991. Mapping Critical Loads for Europe. RIVM Report no. 259101001.

1. NAME OF THE MODEL : CSOIL

2. CONTACT IN RIVM

Name	:	Jan Koolenbrander, Reinier van den Berg,
Laboratory	:	LBG
Phone	:	030-743940/743350 Fax: 030-292897

3. PURPOSE : Calculation of human exposure to soil contamination.

4. POLICY THEME : Public health, risk assessment

5. TECHNICAL SPECIFICATIONS

Processes	:	human exposure pathways: inhalation, soil ingestion, dermal uptake, drinking water intake, consumption of plants
Compartments	:	soil, soil water, soil air, indoor and outdoor air
Components/compounds	:	metals and trace elements, inorganic compounds, aromatic compounds, polycyclic aromatic compounds, chlorinated chloro-hydrocarbons, pesticides, other pollutants
Spatial resolution		
Discretization	:	-
Dimension	:	OD
Length scale	:	-
Application scale	:	local
Temporal resolution		
Timestep	:	-
Calculation timestep	:	-
Output timestep	:	-
Input data	:	solubility, Henry constant, molecular weight, octanol-water distribution coefficient; Tolerable Daily Intake
Output data	:	potential risk: average daily dose in case of lifelong exposure; soil and/or groundwater standards, intervention values
User interface		
Operation	:	
Communication language	:	English
Computer code		
Programming language	:	QBASIC
Comment language	:	none
Runtime	:	seconds

6. STATUS

Final working version ?	:	no	Version no.: -
SOP	:	no	SO no.: -
User's guide	:	no	
Tech. ref. manual	:	yes	
Application reports	:	yes	
Under development?	:	yes	

7. AVAILABILITY

Available outside RIVM?	:	no
User contract mandatory?	:	-
Costs	:	-

8. DOCUMENTATION

Van den Berg, R., 1991. Blootstelling van de mens aan bodemverontreiniging. Een kwalitatieve en kwantitatieve analyse, leidend tot voorstellen voor humaan toxicologische C-toetsingswaarden. RIVM Report no. 725201006.

1. NAME OF THE MODEL : **DAMP**

2. CONTACT IN RIVM

Name	:	Petra van Egmond
Laboratory	:	MTV-MK
Phone	:	030-743610

3. PURPOSE : Calculation of ammonia emissions from manure in the Netherlands.

4. POLICY THEME : Acidification

5. TECHNICAL SPECIFICATIONS

Processes	:	emissions
Compartments	:	air
Components/compounds	:	ammonia (NH_3)
Spatial resolution		
Discretization	:	fixed
Dimension	:	1D
Length scale	:	
Application scale	:	regional (Netherlands)
Temporal resolution		
Timestep	:	fixed
Calculation timestep	:	1 year
Output timestep	:	1 year
Input data	:	animal numbers, stable type and penetration, distribution paterns of manure, manure application techniques and penetration.
Output data	:	annual NH_3-emission per combination of animal type and emission source (stable, storage, meadows, manure spreading).
User interface		
Operation	:	Interactive
Communication language	:	Dutch
Computer code		
Programming language	:	Lotus 1-2-3
Comment language	:	Dutch
Runtime	:	3 sec.

6. STATUS

Final working version ?	:	yes	Version no.: -
SOP	:	no	SOP no.: -
User's guide	:	no	
Tech. ref. manual	:	no	
Application reports	:	no	
Under development?	:	no	

7. AVAILABILITY

Available outside RIVM?	:	no
User contract mandatory?	:	-
Costs	:	-

8. DOCUMENTATION

None

1. NAME OF THE MODEL : **DAS** (Dutch Acidification Systems model)

2. CONTACT IN RIVM

Name : Aaldrik Tiktak
Laboratory : LBG
Phone : 030-743343. Fax: 030-292897

3. PURPOSE : Simulation of the effects of acidification abatement strategies on forests, forest soils, heathland and heathland lakes. Calculation of deposition of potential acid on these receptors by means of Source Receptor Matrices.

4. POLICY THEME : Acidification

5. TECHNICAL SPECIFICATIONS

Processes : atmospheric emission and deposition, soil chemistry, nutrient cycling, forest growth, surface water chemistry
Compartments : air, soil, vegetation, heathland lakes
Components/compounds : H^+, Al^{3+}, Ca^{2+}, Mg^{2+}, K^+, Na^+, NH_4^+, NO_3^-, SO_4^-, Cl^-, HCO_3^-, $RCOO^-$

Spatial resolution
Discretization : variable
Dimension : 1 D
Length scale : km
Application scale : regional

Temporal resolution
Timestep : fixed
Calculation timestep : 1 day - 1 year
Output timestep : 1 year

Input data : emission scenario's for acidifying compounds, characteristics of soil, water and vegetation
Output data : effects of these scenarios on chemical concentration and fluxes in air soil and water, forest growth, heathland survival

User interface
Operation : Batch
Communication language : English

Computer code
Programming language : ANSI C & FORTRAN 77
Comment language : English

Runtime : 24 hours (HP workstation)

6. STATUS

Final working version ? : yes Version no.: -
SOP : yes SOP no.: LBG/808
User's guide : yes
Tech. ref. manual : yes
Application reports : yes
Under development? : yes

7. AVAILABILITY

Available outside RIVM? : no
User contract mandatory? : -
Costs : -

8. DOCUMENTATION

Bakema *et al.*, 1990. Dutch Acidification Systems model - Specifications. Dutch Priority Programme on Acidification 114.1.01. RIVM, Bilthoven.

1. NAME OF THE MODEL : **DCOW**

2. CONTACT IN RIVM

Name	:	H.J.G.M. Derks
Laboratory	:	BFT
Phone	:	030-742033

3. PURPOSE : Predicting kinetics of 2,3,7,8-TCDD in cow's

4. POLICY THEME :

5. TECHNICAL SPECIFICATIONS

Processes	:	Oral uptake, distribution and elimination via milkfat excretion and metabolism
Compartments	:	Blood, liver, udder, fat, poorly and richly perfused organs/tissues
Components/compounds	:	2,3,7,8-TCDD
Spatial resolution		
Discretization	:	fixed
Dimension	:	0D
Length scale	:	-
Application scale	:	-
Temporal resolution		
Timestep	:	fixed
Calculation timestep	:	variable
Output timestep	:	1 d
Input data	:	dose, fat weight, milk production
Output data	:	Various kinetic parameters (C(t), AUC, half lifes, etc.) for milk organs and tissues
User interface		
Operation	:	Interactive & Batch
Communication language	:	English
Computer code		
Programming language	:	Simusolv-ACSL, FORTRAN 77
Comment language	:	-
Runtime	:	

6. STATUS

Final working version ?	:	no	Version no.: -
SOP	:	no	SOP no.: -
User's guide	:	no	
Tech. ref. manual	:	no	
Application reports	:	no	
Under development?	:	yes	

7. AVAILABILITY

Available outside RIVM?	:	no
User contract mandatory?	:	-
Costs	:	-

8. DOCUMENTATION

None

1. NAME OF THE MODEL : **DEADM**

2. CONTACT IN RIVM

Name	:	Jan Willem Erisman
Laboratory	:	LLO
Phone	:	030-742824 Fax: 030-287531

3. PURPOSE : calculation of deposition flux of SO_x, NO_y, and NH_x with high spatial resolution using an inferential method

4. POLICY THEME : acidification, eutrophication

5. TECHNICAL SPECIFICATIONS

Processes	:	deposition processes
Compartments	:	atmospheric boundary layer
Components/compounds	:	acidifying components: SO_x, NO_y, NH_y and HCl
Spatial resolution		
Discretization	:	fixed
Dimension	:	2D
Length scale	:	5 km
Application scale	:	5x5 km to national
Temporal resolution		
Timestep	:	variable
Calculation timestep	:	2h
Output timestep	:	monthly, seasonal or yearly averaged
Input data	:	concentrations, meteo parameters, roughness map
Output data	:	deposition fields
User interface		
Operation	:	Interactive / Batch
Communication language	:	Dutch
Computer code		
Programming language	:	FORTRAN
Comment language	:	English
Runtime	:	3-4 days on HP9000-840 for calculation of the whole of The Netherlands

6. STATUS

Final working version ?	:	yes	Version no.: 1.0
SOP	:	no	SOP no.: LLO/AP/100
User's guide	:	no	
Tech. ref. manual	:	no	
Application reports	:	yes	
Under development?	:	yes	

7. AVAILABILITY

Available outside RIVM?	:	no
User contract mandatory?	:	-
Costs	:	-

8. DOCUMENTATION

Erisman, J.W., 1991. Acid deposition in the Netherlands. RIVM Report no. 723001002.
Erisman, J.W., 1992. Atmospheric deposition of acidifying compounds in The Netherlands. Thesis, Univ. of Utrecht.

1. NAME OF THE MODEL : **DeltaWat**

2. CONTACT IN RIVM

Name : Joost Knoop
Laboratory : LWD
Phone : 030 - 743127 Fax: 030 - 252066

3. PURPOSE : To trace the upstream sources of pollutants in sedimentation areas, and Dutch coastal regions, and to conduct an environmental assessment of the effects in the Dutch delta

4. POLICY THEME : Dispersion, eutrophication

5. TECHNICAL SPECIFICATIONS

Processes : transport; sorption; algal growth; sedimentation; resuspension; burial; diffussion; nitrification; denitrification; oxygen exchange; mineralization
Compartments : water, sediments, phytoplankton
Components/compounds : nutrients: N, P, Si; heavy metals: Cd
Spatial resolution
Discretization : fixed
Dimension : 2D
Length scale : meter
Application scale : fluvial
Temporal resolution
Timestep : variable
Calculation timestep : variable
Output timestep : variable
Input data : initial concentrations, discharges, boundary concentrations, wind speed, emissions
Output data : variable
User interface
Operation : Interactive & Batch
Communication language : English
Computer code
Programming language : ACSL
Comment language : English
Runtime :

6. STATUS

Final working version ? : yes Version no.: 1.0
SOP : no SOP no.: -
User's guide : no
Tech. ref. manual : no
Application reports : no
Under development? : yes

7. AVAILABILITY

Available outside RIVM? : no
User contract mandatory? : -
Costs : -

8. DOCUMENTATION

None

1. NAME OF THE MODEL : **DEMNAT2**

2. CONTACT IN RIVM

Name : J.B.S. Gan / J.G. Nienhuis
Laboratory : LBG
Phone : 030-743397 / 743366 Fax: 292897

3. PURPOSE : Prediction of changes in nature value due to changes in national water management

4. POLICY THEME : Drinking Water Management and Desiccation

5. TECHNICAL SPECIFICATIONS

Processes : Ecological effect-functions
Compartments : Ecosystems
Components/compounds : Ecological groups
Spatial resolution
Discretization : variable
Dimension : 2D
Length scale : no scale
Application scale : regional
Temporal resolution
Timestep : fixed
Calculation timestep : 20 years
Output timestep : 20 years
Input data : hydrological doses, ecosystem completeness, soil information (groundwater head classes and soil types)
Output data : changes in completeness of ecosystems and changes of nature value of ecosystems
User interface
Operation : Interactive & Batch
Communication language : Dutch
Computer code
Programming language : FORTRAN 77 & Arc Macro Language (GIS)
Comment language : English/Dutch
Runtime : variable (depends of number of calculations and type of hardware: 20.000 grid cells on HP400 is approx. 0.5 hours)

6. STATUS

Final working version ? : yes Version no.: 0.07
SOP : no SOP no.: -
User's guide : no
Tech. ref. manual : yes
Application reports : yes
Under development? : yes

7. AVAILABILITY

Available outside RIVM? : no (RIZA only)
User contract mandatory? : -
Costs : -

8. DOCUMENTATION

Witte, J.P.M., C.L.G. Groen & J.G. Nienhuis, 1992. Het ecohydrologisch voorspellingsmodel DEMNAT-2; conceptuele modelbeschrijving. RIVM Report no. 714305007.
Nienhuis, J.G., J.B.S. Gan & R. Lieste, 1992. Het ecohydrologisch voorspellingsmodel DEMNAT-2; technische modelbeschrijving. RIVM Report no. 714305008.
Beugelink, G.P., F.A.M. Claessen & J.H.C. Mülschlegel, 1992. Effecten op natuur van grondwaterwinning t.b.v. Beleidsplan Drink- en Industriewatervoorziening en MER. RIVM Report 714305010.

1. NAME OF THE MODEL : **DILMOD**

2. CONTACT IN RIVM

Name	:	A.C.M. de Nijs
Laboratory	:	LWD
Phone	:	030 - 743812 Fax: 030 - 252066

3. PURPOSE : Estimation of dilution of effluents from waste water treatment plant in the Netherlands

4. POLICY THEME : dispersion

5. TECHNICAL SPECIFICATIONS

Processes	:	distribution and removal
Compartments	:	water
Components/compounds	:	various compounds
Spatial resolution		
Discretization	:	variable
Dimension	:	2D
Length scale	:	variable
Application scale	:	local
Temporal resolution		
Timestep	:	steady state
Calculation timestep	:	
Output timestep	:	
Input data	:	concentration in effluent, effluent discharge, surface water discharge
Output data	:	concentration/dilution gradients in surface water
User interface		
Operation	:	Interactive & Batch
Communication language	:	English
Computer code		
Programming language	:	Mathcad / Lotus 1-2-3
Comment language	:	English
Runtime	:	1 minute on 486-PC

6. STATUS

Final working version ?	:	yes Version no.: 1.0
SOP	:	no SOP no.: -
User's guide	:	no
Tech. ref. manual	:	yes
Application reports	:	yes
Under development?	:	no

7. AVAILABILITY

Available outside RIVM?	:	no
User contract mandatory?	:	-
Costs	:	

8. DOCUMENTATION

De Greef, J. & De Nijs, A.C.M., 1990. Risk assessment of new chemical substances. Dilution of effluent in The Netherlands. RIVM Report no. 670208001.

De Nijs, T. & De Greef, J., 1992. Ecotoxicological risk evaluation of the cationic fabric softener DTDMAC. II. Exposure modelling. Chemosphere 24, 611-627.

1. NAME OF THE MODEL : **Dioxin Chain Model**

2. CONTACT IN RIVM

Name	:	Wout Slob
Laboratory	:	CWM
Phone	:	030-743242

3. PURPOSE : Estimation of dioxin concentrations in cow's milk resulting from emissions of a local source

4. POLICY THEME : Risk management

5. TECHNICAL SPECIFICATIONS

Processes	:	emission, atmospheric dispersion, dry and wet deposition, accumulation in soil, wash-off from grass by rain, toxicokinetics in cow
Compartments	:	atmosphere, soil, grass, cow
Components/compounds	:	PCDDs/PCDFs
Spatial resolution		
Discretization	:	variable
Dimension	:	2D
Length scale	:	
Application scale	:	local
Temporal resolution		
Timestep	:	fixed
Calculation timestep	:	1 month
Output timestep	:	1 month
Input data	:	emission, source characteristics (stack height, heat content, particle size distribution), meteo
Output data	:	dioxin concentrations in cow's milk (long or short term)
User interface		
Operation	:	Batch
Communication language	:	English
Computer code		
Programming language	:	FORTRAN, Genstat
Comment language	:	English
Runtime	:	0

6. STATUS

Final working version ?	:	yes	Version no.: 1.0
SOP	:	no	SOP no.: -
User's guide	:	no	
Tech. ref. manual	:	no	
Application reports	:	yes	
Under development?	:	no	

7. AVAILABILITY

Available outside RIVM?	:	no
User contract mandatory?	:	-
Costs	:	-

8. DOCUMENTATION

Slob, W., O. Klepper & J.A. van Jaarsveld, 1993. A chain model for dioxins: from emissions to cow's milk. RIVM Report no. 37050139.

Slob W. & J.A. van Jaarsveld, 1993. A chain model for dioxins: from emission to cow's milk. Chemosphere 27, 509-516.

1. NAME OF THE MODEL : **DRANC** (Dutch Risk Assessment system for New Chemical substances)

2. CONTACT IN RIVM

Name	:	D.T. Jager
Laboratory	:	ECO
Phone	:	030 - 743783

3. PURPOSE : Preliminary risk/hazard assessment for new chemical substances for human beings, aquatic organisms and micro-organisms in a waste water treatment plant.

4. POLICY THEME : Risk management

5. TECHNICAL SPECIFICATIONS

Processes	:	Sorption to sludge/sediment/soil, biodegradation, volatilization, dilution, bioconcentration / bio-accumulation, leaching, transport through air, deposition, drinking water purification, waste water treatment.
Compartments	:	Air, surface water, soil, groundwater, drinking water, plants, cattle (meat+milk).
Components/compounds	:	New chemical substances
Spatial resolution		
Discretization	:	none
Dimension	:	0D
Length scale	:	100-1000m from a source
Application scale	:	local (generic = not site specific)
Temporal resolution		
Timestep	:	steady state
Calculation timestep	:	-
Output timestep	:	-
Input data	:	Substance characteristics, toxicity to fish/Daphnia/algae (L(E)C50), toxicity to micro-organisms (IC50), toxicity to mammals (DWE).
Output data	:	Hazard quotient + probability distribution for aquatic ecosystems, human beings and micro-organisms.
User interface		
Operation	:	Interactive
Communication language	:	English
Computer code		
Programming language	:	Turbo Pascal
Comment language	:	English
Runtime	:	< 1 min. per substance

6. STATUS

Final working version ?	:	yes Version no.: 1.1
SOP	:	no SOP no.: -
User's guide	:	yes
Tech. ref. manual	:	yes
Application reports	:	yes
Under development?	:	yes

7. AVAILABILITY

Available outside RIVM?	:	yes
User contract mandatory?	:	no
Costs	:	handling costs

8. DOCUMENTATION

Toet, C. et al., 1991. Risk Assessment System of New Chemical Substances; System realisation and validation II. RIVM Report no. 679102004.

1. NAME OF THE MODEL : **EAST**

2. CONTACT IN RIVM

Name	:	Johannes Bollen
Laboratory	:	MTV
Phone	:	030-743610

3. PURPOSE : Assessment of economic development in Eastern Europe in terms of environmental indicators

4. POLICY THEME : Public Health , Acidification

5. TECHNICAL SPECIFICATIONS

Processes	:	economy, energy use, emissions, waste
Compartments	:	air, soil
Components/compounds	:	SOx, NOx, Cd, dust, VOC, CO2, municipal solid waste
Spatial resolution		
Discretization	:	fixed
Dimension	:	2D
Length scale	:	based on administrative entities
Application scale	:	continental
Temporal resolution		
Timestep	:	fixed
Calculation timestep	:	1 year
Output timestep	:	10 year
Input data	:	economic data, emission inventory, energy balances
Output data	:	emissions projections
User interface		
Operation	:	Interactive
Communication language	:	English
Computer code		
Programming language	:	Lotus 1-2-3
Comment language	:	no
Runtime	:	5 sec.

6. STATUS

Final working version ?	:	yes	Version no.: -
SOP	:	no	SOP no.: -
User's guide	:	no	
Tech. ref. manual	:	no	
Application reports	:	yes	
Under development?	:	yes	

7. AVAILABILITY

Available outside RIVM?	:	no
User contract mandatory?	:	-
Costs	:	-

8. DOCUMENTATION

Bollen, J.C., J.-P. Hettelingh & R.J.M. Maas, 1994. Scenarios for economy and environment in Central and Eastern Europe. RIVM Report, in prep.

1. NAME OF THE MODEL : **ECOSAT**

2. CONTACT IN RIVM

Name	:	Dico Fraters
Laboratory	:	LBG
Phone	:	030-744039 Fax: 030-292897

3. PURPOSE : Calculate the chemical equilibrium composition of solutions in dependency of speciation and transport.

4. POLICY THEME : General research model e.g. for dispersion and removal

5. TECHNICAL SPECIFICATIONS

Processes	:	dissolution / precipitation, adsorption / desorption, complexation
Compartments	:	aqueous systems
Components/compounds	:	dissolved species, sorbed species, gasses, minerals, and precipitates of major inorganic components
Spatial resolution		
Discretization	:	-
Dimension	:	OD
Length scale	:	-
Application scale	:	-
Temporal resolution		
Timestep	:	equilibrium calculation
Calculation timestep	:	-
Output timestep	:	-
Input data	:	components, (dissolved) species, gasses, minerals, particles, surface species, temperature, ionic strength, total concentration of components
Output data	:	speciation, adsorbed, precipitated and dissolved amounts of selected components and species
User interface		
Operation	:	Interactive & batch
Communication language	:	English
Computer code		
Programming language	:	FORTRAN & Pascal
Comment language	:	unknown
Runtime	:	2 seconds on PC-386, calculating equilibrium during titration in 5 steps for- and backwards for 4 components and 21 species

6. STATUS

Final working version ?	:	yes Version no.: 1.1
SOP	:	yes SOP no.: LBG/824
User's guide	:	yes
Tech. ref. manual	:	yes
Application reports	:	yes
Under development?	:	yes

7. AVAILABILITY

Available outside RIVM?	:	Developed and maintained by M.G. Keizer, Agricultural University Wageningen, Department of Soil Science and Plant Nutrition
User contract mandatory?	:	yes
Costs	:	contact M.G. Keizer

8. DOCUMENTATION

Keizer, M.G., 1991. ECOSAT: a computer program for the calculation of speciation in soil-water systems. Wageningen: Agricultural University Wageningen, Department of Soil Science and Plant Nutrition.

1. NAME OF THE MODEL : **EDGAR** (Emission Database for Global Atmospheric Research)

2. CONTACT IN RIVM

Name : C.W.M. van der Maas, J.G.J. Olivier, A.F. Bouwman
Laboratory : LAE
Phone : 030-743526/3024 Fax: 030-293651 Email: laecwm@rivm.nl

3. PURPOSE : To calculate global emissions and to generate emission-maps of the world on 1*1 km grid.

4. POLICY THEME : for all themes but especially for greenhouse gasses .

5. TECHNICAL SPECIFICATIONS

Processes : the model is to be considered as a administration and calculation tool: no specific mathematical operations
Compartments : air
Components/compounds : all chemical compounds
Spatial resolution
Discretization : -
Dimension : 2D
Length scale : km, degree
Application scale : global
Temporal resolution
Timestep : flexible (min. 1 year)
Calculation timestep : min. 1 year
Output timestep : min. 1 year
Input data : activity levels per country for a list of economic sectors (e.g. energy use, transportation, agricultural production); emission coefficients for different chemical compounds; activity levels per gridcel of the world (population density, deforestation etc.).
Output data : emission production, global or per country, region, gridcel, sector, and chemical compound, for chosen years
User interface
Operation : Interactive, GUI
Communication language : English
Computer code
Programming language : Ingres Windows 4GL, C, ARC/Info
Comment language : English
Runtime : depends on many factors (1 to 5 minutes)

6. STATUS

Final working version ? : No Version no.: -
SOP : No SOP no.: -
User's guide : not yet, only starters guide (on-line help available)
Tech. ref. manual : yes
Application reports : no
Under development? : yes

7. AVAILABILITY

Available outside RIVM? : no
User contract mandatory? : -
Costs : -

8. DOCUMENTATION

Baars, H.P., Berdowski, J.J.M. & Veldt, C., 1991. Preliminary study on a global emission database (EDGAR). TNO Institude of environmental sciences, TNO-report R91/136.
Van der Maas, C.W.M., Berdowski, J.J.M., Olivier, J.G.J. & Bouwman, A.F., in prep. Information analysis of EDGAR: Emission Database for Global Atmospheric Research. RIVM report no. 776001001.

1. NAME OF THE MODEL : **EQ3NR**

2. CONTACT IN RIVM

Name	:	Rikje van de Weerd
Laboratory	:	LBG
Phone	:	030-743314 Fax. 030-292897

3. PURPOSE : Calculate the chemical equilibrium composition of solution and the saturation indices for minerals

4. POLICY THEME : General research model e.g. for dispersion and removal

5. TECHNICAL SPECIFICATIONS

Processes	:	dissolution/precipitation, complexation
Compartments	:	aqueous systems
Components/compounds	:	dissolved species, gasses, minerals
Spatial resolution		
Discretization	:	-
Dimension	:	OD
Length scale	:	-
Application scale	:	-
Temporal resolution		
Timestep	:	equilibrium calculation
Calculation timestep	:	-
Output timestep	:	-
Input data	:	temperature, density of aqueous phase, total dissolved salts, redox state, total concentration of components, geochemical database
Output data	:	speciation of solution, saturation indices of the minerals in the database
User interface		
Operation	:	Batch
Communication language	:	English
Computer code		
Programming language	:	FORTRAN
Comment language	:	Unknown
Runtime	:	problem dependent, about 30 sec. CPU on Alliant for a more complex problem (calculation of equilibrium for a system with 17 active components, 252 active species and 346 active minerals, iteration converged in 4 steps)

6. STATUS

Final working version ?	:	yes	Version no.: 3245
SOP	:	yes	SOP no.: LBG/822
User's guide	:	yes	
Tech. ref. manual	:	yes	
Application reports	:	yes	
Under development?	:	yes	

7. AVAILABILITY

Available outside RIVM?	:	Developed and maintained by Thomas J. Wolery, Lawrence Livermore National Laboratory, California, USA
User contract mandatory?	:	-
Costs	:	contact T.J. Wolery

8. DOCUMENTATION

Wolery, T.J., 1983. EQ3NR: A Computer Program for Geochemical Aqueous Speciation-Solubility Calculations: User's Guide and Documentation. Lawrence Livermore National Laboratory, California, USA.

1. NAME OF THE MODEL : **EQ6**

2. CONTACT IN RIVM

Name	:	Rikje van de Weerd
Laboratory	:	LBG
Phone	:	030-743314 Fax: 030-292897

3. PURPOSE : Calculates chemical evolution in reacting systems consisting of water and minerals or other solids (eg for titrations, reactions in closed systems or flow through open systems)

4. POLICY THEME : Waste Removal

5. TECHNICAL SPECIFICATIONS

Processes	:	dissolution/precipitation, complexation, reaction kinetics
Compartments	:	aqueous systems
Components/compounds	:	dissolved species, gasses, reactants and secondary minerals
Spatial resolution		
Discretization	:	-
Dimension	:	OD
Length scale	:	-
Application scale	:	-
Temporal resolution		
Timestep	:	variable
Calculation timestep	:	variable (relative or absolute rate)
Output timestep	:	variable
Input data	:	kind of reacting system, temperature, relative or absolute reaction rates, reactants with their (relative) dissolution kinetics, output from EQ3NR or previous EQ6 run, geochemical database
Output data	:	speciation of solution, saturation indices of the minerals in the database, amount of reactants destroyed and secondary minerals formed as a function of (relative) time
User interface		
Operation	:	Batch
Communication language	:	English
Computer code		
Programming language	:	FORTRAN
Comment language	:	English
Runtime	:	problem dependent, up to more than 3 hours CPU on Alliant for a more complex problem

6. STATUS

Final working version ?	:	yes Version no.: 3245
SOP	:	yes SOP no.: LBG/823
User's guide	:	yes
Tech. ref. manual	:	yes
Application reports	:	yes
Under development?	:	yes

7. AVAILABILITY

Available outside RIVM?	:	Developed and maintained by T.J. Wolery, Lawrence Livermore National Laboratory, USA
User contract mandatory?	:	-
Costs	:	Contact T.J. Wolery

8. DOCUMENTATION

Wolery, T.J. & S.A. Daveler, 1989. EQ6: A computer Program for Reaction Path Modeling of Aqueous Geochemical Systems: User's Guide and Documentation. Lawrence Livermore National Laboratory, California, USA.

1. NAME OF THE MODEL : **ESCAPE**

2. CONTACT IN RIVM

Name : J.M. Alcamo
Laboratory : MTV
Phone : 030-743487 Fax: 030-250740 Email: mobijoe@rivm.nl

3. PURPOSE : Evaluation of Policy Options to Deal with the Greenhouse Effect

4. POLICY THEME : Global change, climate change

5. TECHNICAL SPECIFICATIONS

Processes : Greenhouse effect, atmospheric dynamics, atmospheric chemistry, sea level rise, impacts
Compartments : Air, water, land use
Components/compounds : Greenhouse gases, temperature, precipitation, emissions
Spatial resolution
Discretization : fixed
Dimension : 2D
Length scale : Europe
Application scale : regional, continental, global
Temporal resolution
Timestep : fixed
Calculation timestep : year
Output timestep : 5-year
Input data : Data on population, GNP, energy (fuel, solar, etc.), climate, atmosphere
Output data : Emissions, concentrations, temperature (global and regional), sea level rise, climate change, risk assessment
User interface
Operation : Interactive
Communication language : English
Computer code
Programming language : Turbo Pascal, FORTRAN 77, C
Comment language : English
Runtime : about 2 hours on PC 386

6. STATUS

Final working version ? : yes Version no.: 1.1
SOP : no SOP no.: -
User's guide : yes
Tech. ref. manual : yes
Application reports : yes
Under development? : no

7. AVAILABILITY

Available outside RIVM? : yes (Distributor: Climate Research Unit, Norwich, U.K.)
User contract mandatory? : yes
Costs : commercial price

8. DOCUMENTATION

Development of a Framework for the Evaluation of Policy Options to deal with the Greenhouse Effect:

- A User Manual for the **ESCAPE** Software: Version 1.1
- Summary Report: Assessment of Strategic Options
- Economic Evaluation of Impacts and Adaptive Measures in the European Community
- A Scientific Description of the **ESCAPE** Model: Version 1.1

1. NAME OF THE MODEL : **ETX**

2. CONTACT IN RIVM

Name	:	T. Aldenberg
Laboratory	:	LWD
Phone	:	030 - 743137 Fax: 030 - 252066

3. PURPOSE : calculation of maximum allowable concentration from laboratory toxicity data; calculation of percentage unprotected species at given exposure data

4. POLICY THEME : risk assessment

5. TECHNICAL SPECIFICATIONS

Processes	:	confidence limits of percentiles of a logistic distribution
Compartments	:	-
Components/compounds	:	any
Spatial resolution		
Discretization	:	
Dimension	:	0D
Length scale	:	
Application scale	:	
Temporal resolution		
Timestep	:	
Calculation timestep	:	
Output timestep	:	
Input data	:	laboratory toxicity data (NOEC)
Output data	:	left confidence limits of safe concentrations (95%, 50%)
User interface		
Operation	:	Interactive
Communication language	:	English
Computer code		
Programming language	:	Turbo Pascal 5.5
Comment language	:	English
Runtime	:	seconds

6. STATUS

Final working version ?	:	yes	Version no.: 1.3a
SOP	:	no	SOP no.: -
User's guide	:	yes	
Tech. ref. manual	:	yes	
Application reports	:	yes	
Under development?	:	yes	

7. AVAILABILITY

Available outside RIVM?	:	yes
User contract mandatory?	:	yes
Costs	:	Dfl. 700,-

8. DOCUMENTATION

Aldenberg, T. & W. Slob, 1991. Confidence Limits for Hazardous concentrations based on logistically distributed NOEC toxicity Data. RIVM Report no. 719102002.

Aldenberg, T., 1993. ETX 1.3a. A program to calculate confidence limits of hazardous concentrations based on small samples of toxicity data. RIVM Report no. 719102015.

1. NAME OF THE MODEL : **EUPUFF**

2. CONTACT IN RIVM

Name : Addo van Pul
Laboratory : LLO
Phone : 030-742818 Fax: 030-287531 Email: addo@rivm.nl

3. PURPOSE : lagrangian model for the real-time calculation of concentration and deposition of accidentially released pollutants; calculation of prognostic concentrations fields.

4. POLICY THEME : dispersion

5. TECHNICAL SPECIFICATIONS

Processes : atmospheric transport, dispersion, deposition and (first order) chemical transformation
Compartments : atmospheric boundary layer (2 levels up to ca. 3 km)
Components/compounds : gaseous or particulate pollutants and components which show a linear decay (e.g. radioactive material)

Spatial resolution
Discretization : variable
Dimension : 3D
Length scale : minimal 30 km
Application scale : from local to continental

Temporal resolution
Timestep : fixed: one hour
Calculation timestep : depending on wind speed (max .5 hour)
Output timestep : one hour

Input data : actual meteorology (special meteo-database is required); source info (source strenght, emission height, location, etc)
Output data : hourly averaged concentration and deposition fields

User interface
Operation : Interactive or Batch
Communication language : english

Computer code
Programming language : FORTRAN
Comment language : dutch/english

Runtime :

6. STATUS

Final working version ? : yes Version no.: 4.0
SOP : no SOP no.: -
User's guide : yes
Tech. ref. manual : yes
Application reports : yes
Under development? : no

7. AVAILABILITY

Available outside RIVM? : no, only at KNMI
User contract mandatory? : -
Costs : -

8. DOCUMENTATION

Van Pul, W.A.J., 1992. Technical description of the RIVM/KNMI Puff dispersion model version 4.0. RIVM Report no. 222501003.

Verwer, G.H.L. & De Leeuw, F.A.A.M, 1992. An Operational Puff dispersion model. Atmos. Envir. 26A, 3179-3193.

1. NAME OF THE MODEL : **EUROS**

2. CONTACT IN RIVM

Name	:	Liesbeth de Waal
Laboratory	:	LLO
Phone	:	030-742362 Fax: 030-287531

3. PURPOSE : eulerian model for calculation of deposition and concentration of SO_2, NO_x and their oxidation products during episodes.

4. POLICY THEME : dispersion, acidification, winter smog forecasting

5. TECHNICAL SPECIFICATIONS

Processes	:	atmospheric transport, dispersion, deposition and chemical transformation
Compartments	:	atmospheric boundary layer (4 levels up to ca. 3 km)
Components/compounds	:	SO_2, SO_4, NO_x, NO_3
Spatial resolution		
Discretization	:	fixed
Dimension	:	3D
Length scale	:	ca. 55x55 km
Application scale	:	continental
Temporal resolution		
Timestep	:	fixed
Calculation timestep	:	depending on windspeed
Output timestep	:	one hour
Input data	:	actual meteorology (obtained from ECMWF/KNMI), special meteo-database is required. Emissions of SO_2 and NO_x on a European scale (55x55 km^2), an indication of the distribution of total emissions over the source categories heavy industry, small industry, traffic and space heating is required.
Output data	:	hourly concentration and deposition fields
User interface		
Operation	:	Interactive and/or Batch
Communication language	:	Dutch
Computer code		
Programming language	:	FORTRAN
Comment language	:	mixture of english and dutch
Runtime	:	ca. 20 min CPU (HP9000) per 24h simulation period ??

6. STATUS

Final working version ?	:	yes Version no.: 1.0
SOP	:	no SOP no.: -
User's guide	:	yes
Tech. ref. manual	:	no
Application reports	:	yes
Under development?	:	yes

7. AVAILABILITY

Available outside RIVM?	:	no
User contract mandatory?	:	-
Costs	:	-

8. DOCUMENTATION

Van Rheineck Leyssius *et al.*, 1990. A regional scale model for the calculation of episodic concentration and deposition of acidifying components. Water Air Soil Pollut. 51, 327-344.

1. NAME OF THE MODEL : **EUTREND**

2. CONTACT IN RIVM

Name : Hans van Jaarsveld
Laboratory : LLO
Phone : 030-742818 Fax: 030-287531 Email: hansvj@rivm.nl

3. PURPOSE : calculation of (long term) atmospheric concentration and deposition of primary emitted and secondary produced (acidifying) components over Europe; general purpose model

4. POLICY THEME : dispersion, acidification

5. TECHNICAL SPECIFICATIONS

Processes : atmospheric transport, dispersion, dry and wet deposition and chemical transformation
Compartments : atmospheric boundary layer (2 levels up to ca. 3 km)
Components/compounds : SO_2, SO_4, NO_x, NO_3, NH_3, NH_4, aerosols, POPs
Spatial resolution
Discretization : variable; for Europe: 1^0 longitude x 0.5^0 latitude
Dimension : 3D
Length scale : variable from 100 m up to 4000 km
Application scale : Europe including western Atlantic Ocean or sub areas
Temporal resolution
Timestep : variable: from one specific month to a multi-year period
Calculation timestep : n.a.
Output timestep : variable: from one specific month to a multi-year period
Input data : meteorological data (primary and secondary) derived from ECMWF/KNMI surface observations and analysed wind fields over Europe; emissions: within the area of interest emissions must be given with a resolution corresponding with the required resolution of the deposition/concentration maps;
Output data : grids of concentration in air and precip. and dry and wet deposition
User interface
Operation : Interactive / Batch
Communication language : English
Computer code
Programming language : FORTRAN
Comment language : English
Runtime : proportional to no. of sources and receptors, usually 1 min.- 1 day

6. STATUS

Final working version ? : yes Version no.: 1.11
SOP : no SOP no.: -
User's guide : no
Tech. ref. manual : no
Application reports : yes
Under development? : yes

7. AVAILABILITY

Available outside RIVM? : no
User contract mandatory? : -
Costs : -

8. DOCUMENTATION

Van Jaarsveld, J.A., 1993. Atmospheric deposition of cadmium, copper, lead, benzo(a)pyrene and lindane over Europe and its surrounding marine areas (in prep.).

1. NAME OF THE MODEL : **EVAPO**

2. CONTACT IN RIVM

Name : R. Leemans
Laboratory : MTV/LBG
Phone : 030-743377 Fax: 030-292897 Email: mobirik@rivm.nl

3. PURPOSE : Water balance model for large scale applications. The model is currently set up for global applications.

4. POLICY THEME : Climate change

5. TECHNICAL SPECIFICATIONS

Processes : Potential evapotranspiration, actual evapotranspiration, and runoff
Compartments : Climate and soil
Components/compounds : water
Spatial resolution
Discretization : variable (default is 0.5 degree latitude and longitude)
Dimension : 2D
Length scale : 0.5 degree latitude and longitude
Application scale : fluvial, continental, global
Temporal resolution
Timestep : fixed
Calculation timestep : month
Output timestep : year
Input data : Soil moisture holding capacity, monthly temperature, precipitation and cloudiness
Output data : Potential evapotranspiration, actual evapotranspiration, and runoff
User interface
Operation : Batch
Communication language : n.a.
Computer code
Programming language : FORTRAN 77
Comment language : English
Runtime : 4 hours for a global application (=63483 cells) on a SUN IPC

6. STATUS

Final working version ? : yes Version no.: -
SOP : no SOP no.: -
User's guide : no
Tech. ref. manual : no
Application reports : yes
Under development? : yes

7. AVAILABILITY

Available outside RIVM? : yes
User contract mandatory? : no
Costs : handling cost

8. DOCUMENTATION

Leemans, R. & G.J. van den Born, 1993. Determining the potential global distribution of natural vegetation, crops and agricultural productivity. Water, Air and Soil Pollution, in press.
Leemans, R. & W.P. Cramer, 1991. The IIASA database for mean monthly values of temperature, precipitation and cloudiness on a global terrestrial grid. RR-91-18, International Institute of Applied Systems Analyses, Laxenburg.
Prentice, I.C., W. Cramer, S.P. Harrison, R. Leemans, R.A. Monserud & A.M. Solomon, 1992. A global biome model based on plant physiology and dominance, soil properties and climate. Journal of Biogeography 19, 117-134.
Prentice, I.C., M.T. Sykes & W. Cramer, 1993. A simulation model for the transient effects of climate change on forest landscapes. Ecological Modelling 65, 51-70.

1. NAME OF THE MODEL : **EXPECT**

2. CONTACT IN RIVM

Name	:	L.C. Braat
Laboratory	:	MTV
Phone	:	030-743704 Fax: 030-250740

3. PURPOSE : Scoping of environmental policy scenarios, scenario-analysis, environmental and economic impact assessement.

4. POLICY THEME : in principle: all; currently: acidification, and partly eutrophication and dessication

5. TECHNICAL SPECIFICATIONS

Processes	:	economic activity (agriculture, transport, energy production), emissions, resource use, transport & conversion of compounds, ecological dynamics.
Compartments	:	economic, emissions, air, soil, groundwater, forest, heathland, wetlands,
Components/compounds	:	currently: compounds relevant to acidification and eutrophication
Spatial resolution		
Discretization	:	fixed
Dimension	:	2D
Length scale	:	km
Application scale	:	regionalized national
Temporal resolution		
Timestep	:	fixed
Calculation timestep	:	1 year
Output timestep	:	1 year
Input data	:	economic growth, technical measures, emissions, environmental standards, unit costs, compartment parameters.
Output data	:	economic, ecological, environmental indicators
User interface		
Operation	:	Interactive
Communication language	:	English
Computer code		
Programming language	:	C++
Comment language	:	English
Runtime	:	current models: several minutes

6. STATUS

Final working version ?	:	no Version no.: -
SOP	:	no SOP no.: -
User's guide	:	for several modules
Tech. ref. manual	:	for several modules
Application reports	:	no
Under development?	:	yes

7. AVAILABILITY

Available outside RIVM?	:	no
User contract mandatory?	:	-
Costs	:	-

8. DOCUMENTATION

Braat, L.C. (ed.) *et al.*, 1991. EXPECT, outline of an integrated model for environmental Scenario analysis and impact assessment. RIVM Report no. 259102001.

1. NAME OF THE MODEL : **EXPECT-forsol**

2. CONTACT IN RIVM

Name	:	R. Meijers, J.G. van Minnen
Laboratory	:	MTV
Phone	:	030-743556 Fax: 030-250740

3. PURPOSE : Predict the growth of tree stands under forest management and environmental stress scenarios

4. POLICY THEME : Acidification, eutrophication, desication

5. TECHNICAL SPECIFICATIONS

Processes	:	tree growth, root and leaf uptake, photosynthesis
Compartments	:	leaf, fine roots and wooden tissue
Components/compounds	:	N, C, Ca, Mg, K, dry weight biomass
Spatial resolution		
Discretization	:	fixed / variable
Dimension	:	1D
Length scale	:	
Application scale	:	regional
Temporal resolution		
Timestep	:	fixed
Calculation timestep	:	1 year
Output timestep	:	1 year
Input data	:	soil data, air concentration and deposition, species specific tree parameters
Output data	:	dry weight of the compartments, contents of N, Mg, K and Ca in the compartments, height and diameter development
User interface		
Operation	:	Batch
Communication language	:	English
Computer code		
Programming language	:	C++
Comment language	:	English
Runtime	:	5-10 seconds for 100 years and one site type (on a PC-386 under Unix)

6. STATUS

Final working version ?	:	no	Version no.: 1.0
SOP	:	no	SOP no.: -
User's guide	:	no	
Tech. ref. manual	:	no	
Application reports	:	no	
Under development?	:	yes	

7. AVAILABILITY

Available outside RIVM?	:	no
User contract mandatory?	:	-
Costs	:	-

8. DOCUMENTATION

Van Minnen, J.G. & R. Meijers, 1993. Forsol, the EXPECT forest module. RIVM Report no. 259102005.

1. NAME OF THE MODEL : **EXPECT-Heathsol**

2. CONTACT IN RIVM

Name	:	A.H. Bakema
Laboratory	:	MTV
Phone	:	030-743531 Fax: 030-250740

3. PURPOSE : Predict the development of a heather/grass vegetation in dependence of various N-deposition regimes

4. POLICY THEME : Acidification, eutrophication

5. TECHNICAL SPECIFICATIONS

Processes	:	Growth, Nitrogen uptake, light- and N-competetion
Compartments	:	roots, stems, leaves, branches
Components/compounds	:	N, C, dry weight
Spatial resolution		
Discretization	:	-
Dimension	:	1D
Length scale	:	-
Application scale	:	regional
Temporal resolution		
Timestep	:	fixed
Calculation timestep	:	1 year
Output timestep	:	1 year
Input data	:	growth- and competition, characteristics for the heather- and grass-species, and nitrogen deposition
Output data	:	dry weight, N- and C-content of the species
User interface		
Operation	:	within EXPECT interactive, otherwise batch
Communication language	:	English
Computer code		
Programming language	:	C++
Comment language	:	English
Runtime	:	3 seconds on an PC-386 for 100 years simulation

6. STATUS

Final working version ?	:	yes Version no.: 1.2
SOP	:	no SOP no.: -
User's guide	:	no
Tech. ref. manual	:	no
Application reports	:	no
Under development?	:	yes

7. AVAILABILITY

Available outside RIVM?	:	yes
User contract mandatory?	:	no
Costs	:	none

8. DOCUMENTATION

Bakema, A.H., R. Meijers, R. Aerts, F. Berendse & G.W. Heil, 1993. Heathsol, a heathland competition model for use in scenario-analysis. RIVM Report no. 259102006.

1. NAME OF THE MODEL : **EXPECT-locate**

2. CONTACT IN RIVM

Name : K.F de Boer
Laboratory : MTV
Phone : 030-743530 Fax: 030-250740 Email: mtvfb@rivm.nl

3. PURPOSE : Distribute national (Dutch) emissions over regions

4. POLICY THEME : Acidification, eutrophication

5. TECHNICAL SPECIFICATIONS

Processes : Multiplication of one emission with a distribution vector
Compartments : n.a.
Components/compounds : Now available: SO_2, NO_x and NH_3 in 1980. Can be extended if data are available

Spatial resolution
Discretization : fixed
Dimension : 2D
Length scale : variable, depends on data
Application scale : regional / fluvial / continental / global

Temporal resolution
Timestep : n.a.
Calculation timestep : immediate
Output timestep : Identical to input

Input data : Total emissions per timestep, distribution of these emissions in one or more years for these compounds
Output data : distributed emissions

User interface
Operation : Batch
Communication language : n.a.

Computer code
Programming language : C++
Comment language : English

Runtime : Depends on number of matrices available (read time). Calculation time for one year of input -> output: 0.1 sec on a UNIX system.

6. STATUS

Final working version ? : yes Version no.: 1.2
SOP : no SOP no.: -
User's guide : no
Tech. ref. manual : yes
Application reports : yes
Under development? : yes

7. AVAILABILITY

Available outside RIVM? : no
User contract mandatory? : -
Costs : -

8. DOCUMENTATION

Bakema, A.H., K.F. de Boer, G.W. Bultman, J.J.M van Grinsven, C. van Heerden, R.M. Kok, J. Kros, J.G. van Minnen, G.M.J. Mohren, T.N. Olsthoorn, W. de Vries & F.G. Wortelboer, 1990. Dutch Acidification Systems Model - Specifications. Dutch Priority Programme on Acidification, report no. 114.1-01. RIVM, Bilthoven.
G.J. Hey & T. Schneider (eds), 1991. Final report second phase Dutch Priority Programme on Acidification. Dutch Priority Programme on Acidification, report no. 200-09. RIVM, Bilthoven.

1. NAME OF THE MODEL : **EXPO**

2. CONTACT IN RIVM

Name	:	G.M.H. Laheij
Laboratory	:	LSO
Phone	:	030-743829 Fax: 030-291604

3. PURPOSE : EXPO is a simple model to calculate the dose due to external radiation and the inhalation of radioactive (soil) particles.

4. POLICY THEME : Human Exposure

5. TECHNICAL SPECIFICATIONS

Processes	:	External radiation and inhalation
Compartments	:	soil
Components/compounds	:	radionuclides
Spatial resolution		
Discretization	:	fixed
Dimension	:	0D
Length scale	:	-
Application scale	:	local
Temporal resolution		
Timestep	:	-
Calculation timestep	:	-
Output timestep	:	-
Input data	:	activity in soil, gamma energies of radionuclides, inhalation rate, conversion factors, dust level
Output data	:	dose due to external radiation and inhalation
User interface		
Operation	:	Batch
Communication language	:	Dutch
Computer code		
Programming language	:	FORTRAN
Comment language	:	Dutch
Runtime	:	< 1 second on a HP 9000 computer

6. STATUS

Final working version ?	:	yes Version no.: 1.1
SOP	:	yes SOP no.: LSO/P/005
User's guide	:	yes
Tech. ref. manual	:	yes
Application reports	:	yes
Under development?	:	no

7. AVAILABILITY

Available outside RIVM?	:	no
User contract mandatory?	:	-
Costs	:	-

8. DOCUMENTATION

Uijt de Haag, P.A.M. & G.M.H. Laheij, 1993. The MiniBIOS model (version 1A4) at the RIVM. RIVM Report no. 715204004.

1. NAME OF THE MODEL : FACTS (Forecasting Airpollution by Car Traffic Simulation)

2. CONTACT IN RIVM

Name	:	Bert van Wee
Laboratory	:	MTV
Phone	:	030-743654 Fax: 030-250740

3. PURPOSE : Forecasting energy use and emissions of CARS; forecasting car use and car ownership

4. POLICY THEME : Climate change, acidification, disturbance

5. TECHNICAL SPECIFICATIONS

Processes	:	(car) travel behaviour by households; emissions and energy use by cars
Compartments	:	air
Components/compounds	:	households, cars
Spatial resolution		
Discretization	:	fixed
Dimension	:	0D
Length scale	:	-
Application scale	:	national
Temporal resolution		
Timestep	:	fixed
Calculation timestep	:	year
Output timestep	:	- (preset output times: 1990, 1995, 2000, 2005, 2010, 2015)
Input data	:	nr. of households per household class, fuel prices, fixed and variable costs of cars per cartype, parameters of emissions per component, parameters of fuel consumption per car type
Output data	:	number of cars, car use, emissions of NO_x, VOC, CO_2, CO, particulates, SO_2; energy use
User interface		
Operation	:	interactive
Communication language	:	Dutch
Computer code		
Programming language	:	FORTRAN 77
Comment language	:	English
Runtime	:	problem and machine dependent: up to 15 min. on 386 PC

6. STATUS

Final working version ?	:	yes Version no.: 2.0
SOP	:	no SOP no.: -
User's guide	:	yes
Tech. ref. manual	:	yes
Application reports	:	yes
Under development?	:	no

7. AVAILABILITY

Available outside RIVM?	:	yes, developed at NEI
User contract mandatory?	:	-
Costs	:	-

8. DOCUMENTATION

Pronk, M.Y., H. Rose, P.M. Blok, H.J. Smit, 1993. FACTS 2.0 Forecasting Airpollution by Car Traffic Simulation, Nederlands Economisch Instituut.

Van Wee, B. & M.Y. Pronk, 1992. Market-based and technical solutions: the use of the FACTS model in environmental forecasting. Paper presented at the 1992 Cambridge Econometrics Annual Conference Transport, Communications and the Economy, 6-7 July, Fitzwilliam College, Cambridge.

1. NAME OF THE MODEL : **FAME** (Friendly Applied Modelling Environment)

2. CONTACT IN RIVM

Name	:	F.G. Wortelboer
Laboratory	:	LWD
Phone	:	030 - 743128 Fax: 030 - 252066

3. PURPOSE : General modelling environment for user-specified models

4. POLICY THEME : all

5. TECHNICAL SPECIFICATIONS

Processes	:	Integration of Ordinary Differential Equations, Presentation of results
Compartments	:	
Components/compounds	:	
Spatial resolution		
Discretization	:	variable
Dimension	:	0D, 1D, 2D & 3D
Length scale	:	variable
Application scale	:	local, regional, fluvial, continental & global
Temporal resolution		
Timestep	:	variable
Calculation timestep	:	controlled by error criteria on state variables
Output timestep	:	controlled by user
Input data	:	to be specified by user
Output data	:	to be specified by user
User interface		
Operation	:	Interacttive & Batch
Communication language	:	English, general modelling language
Computer code		
Programming language	:	Turbo Pascal 5.0 and higher
Comment language	:	English
Runtime	:	variable

6. STATUS

Final working version ?	:	yes Version no.: 3.0
SOP	:	no SOP no.: -
User's guide	:	yes
Tech. ref. manual	:	yes
Application reports	:	yes
Under development?	:	no

7. AVAILABILITY

Available outside RIVM?	:	yes
User contract mandatory?	:	yes
Costs	:	f 750

8. DOCUMENTATION

Wortelboer, F.G. & T. Aldenberg, 1989. FAME: Friendly Applied Modelling Environment, Version 2.2 User Manual. RIVM Report no. 718900001.

Wortelboer, F.G. & T. Aldenberg, 1994. FAME: Friendly Applied Modelling Environment, Version 3.0 User Manual. RIVM Report, in prep.

Janse, J.H. & Aldenberg, T., 1991. Modelling the eutrophication of the shallow Loosdrecht Lakes. Verh. Internat. Verein. Limnol. 24, 751-757.

Admiraal, W., Mylius, S.D., De Ruyter van Steveninck, E.D. & Tubbing, D.M.J., 1993. A model of phytoplankton production in the lower Rhine river verified by observed changes in silicate concentration. J. Plankton Res. 15, 659-682.

1. NAME OF THE MODEL : **FAO Crops Suitability Assessment**

2. CONTACT IN RIVM

Name : R. Leemans
Laboratory : MTV
Phone : 030-743377 Fax: 030-292897 Email: mobirik@rivm.nl

3. PURPOSE : The crop suitability assessment determines climatically suitable areas for crop growth together with a rainfed yield.

4. POLICY THEME : Climate change

5. TECHNICAL SPECIFICATIONS

Processes : crop growth and production
Compartments : n.a.
Components/compounds : climatic zone, water balance, growing season and crop growth
Spatial resolution
Discretization : variable (default is 0.5o latitude and longitude)
Dimension : 2D
Length scale : 0.5o latitude and longitude
Application scale : continental / global
Temporal resolution
Timestep : fixed
Calculation timestep : days (interpolated from monthly values)
Output timestep : year
Input data : crop characteristics, soil water capacity and monthly values for temperature, precipitation and cloudiness.
Output data : crop production
User interface
Operation : Interactive
Communication language : English
Computer code
Programming language : FORTRAN 77
Comment language : English
Runtime : 5 hours for a global application (=63483 cells) on a SUN IPC

6. STATUS

Final working version ? : yes Version no.: -
SOP : no SOP no.: -
User's guide : no
Tech. ref. manual : yes
Application reports : yes
Under development? : yes

7. AVAILABILITY

Available outside RIVM? : no
User contract mandatory? : no
Costs : handling costs

8. DOCUMENTATION

Anonymous, 1978. Report on the agro-ecological zones project. Report 48, Food and Agricultural Organisation of the United Nations, Rome, 158 pp.

Leemans, R. and G.J. van den Born, 1993. Determining the potential global distribution of natural vegetation, crops and agricultural productivity. Water, Air and Soil Pollution, (in press).

Leemans, R. and A.M. Solomon, 1993. The potential response and redistribution of crops under a doubled CO2 climate. Climate Research, 3: 79-96.

1. NAME OF THE MODEL : **FCONC1, FCONC2**

2. CONTACT IN RIVM

Name	:	Karel Kovar
Laboratory	:	LBG
Phone	:	030-743360 Fax: 030-292897

3. PURPOSE : Calculation of breakthrough concentration curves at abstracting wells, pathlines starting at wells (FCONC1) and pathlines starting at aquifer top (FCONC2). Advection and decay of a single solute.

4. POLICY THEME : drinking water production, dispersion, dessication, waste removal

5. TECHNICAL SPECIFICATIONS

Processes	:	advection, chemical decay
Compartments	:	layered aquifer
Components/compounds	:	water, single solute
Spatial resolution		
Discretization	:	variable
Dimension	:	3D
Length scale	:	m, km
Application scale	:	local
Temporal resolution		
Timestep	:	variable
Calculation timestep	:	variable
Output timestep	:	variable
Input data	:	pathlines and travel times generated by program FLOPZ1, solute concentration variation on aquifer top (both in space and in time)
Output data	:	plot of concentration breakthrough curve at wells
User interface		
Operation	:	batch
Communication language	:	English
Computer code		
Programming language	:	FORTRAN 77
Comment language	:	English
Runtime	:	problem dependent; seconds to minutes CPU on 386 PC

6. STATUS

Final working version ?	:	yes	Version no.: 1: 3.01(13-2-1989) 2: 3.01 (13-2-1989)
SOP	:	yes	SOP no.: LBG/814
User's guide	:	yes	
Tech. ref. manual	:	no	
Application reports	:	no	
Under development?	:	no	

7. AVAILABILITY

Available outside RIVM?	:	yes
User contract mandatory?	:	yes
Costs	:	commercial price

8. DOCUMENTATION

Kovar, K., 1988. Computer Program FCONC1, Breakthrough Concentration Curves at Abstracting Wells, Based on Pathlines Starting at Well Screen. RIVM Report no. 728520006.
Kovar, K., 1988. Computer Program FCONC2, Breakthrough Concentration Curves at Abstracting Wells, Based on Pathlines Starting at Aquifer Top. RIVM Report no. 728520007.

1. NAME OF THE MODEL : **FLOP3N**

2. CONTACT IN RIVM

Name : E.J.M. Veling
Laboratory : CWM
Phone : 030-742072 Fax: 030-250740 Email: cwmedve@rivm

3. PURPOSE : Calculation of travel times and pathlines in a hydrological system.

4. POLICY THEME : Acidification, desiccation, eutrophication

5. TECHNICAL SPECIFICATIONS

Processes : Solution of Laplace equation for determination of the groundwater potential. Determination of the velocity field by analytical derivatives.
Compartments : Maximal 10 layers (aquifers or aquitards).
Components/compounds : water
Spatial resolution
Discretization : continuous
Dimension : 3D, the vertical dimension is exact
Length scale : 10 -1000 m
Application scale : local
Temporal resolution
Timestep : days
Calculation timestep : variable, internally performed by the model
Output timestep : to be specified by the user
Input data : Thickness, horizontal and vertical permeability, porosity layers; location and strength partial well screens (abstraction or infiltration); boundary conditions at the top and at the bottom.
Output data : Information about the particle tracking process, location at specified time instances. Contourlines of the potential in a to be specified horizontal or vertical plane.
User interface
Operation : Batch
Communication language : English
Computer code
Programming language : FORTRAN 77
Comment language : English
Runtime : 10 - 30 min. for a more complex problem on a PC-386.

6. STATUS

Final working version ? : yes Version no.: 1.37 (25-5-'93)
SOP : no SOP no.: -
User's guide : yes
Tech. ref. manual : no
Application reports : yes
Under development? : no

7. AVAILABILITY

Available outside RIVM? : yes
User contract mandatory? : yes
Costs : commercial price

8. DOCUMENTATION :

Veling, E.J.M., 1991. FLOP3N, Pathlines in Three-Dimensional Groundwater Flow in a System of Homogeneous Anisotropic Layers. RIVM Report no. 719106001.
Maas, C., 1991. Stroming naar putten in gelaagde grond. De Ingenieur 103, 20-23.
Veling, E.J.M., 1993. FLOP- grondwaterstroming, nu ook in drie dimensies. H_2O 26, 15-22.

1. NAME OF THE MODEL : **FLOPZ1** (FLOw Path)

2. CONTACT IN RIVM

Name	:	Roland Lieste
Laboratory	:	LBG
Phone	:	030-743407 Fax: 030-292897

3. PURPOSE : Quasi-three-dimensional calculation of pathlines and travel times of groundwater particles in the vicinity of abstracting wells in a layered homogeneous aquifer.

4. POLICY THEME : Drinking water production, dispersion

5. TECHNICAL SPECIFICATIONS

Processes	:	The movement of a water particle in a saturated, phreatic aquifer, due to groundwater abstracting wells and natural recharge. Darcy's law, equation of continuity.
Compartments	:	Fully saturated phreatic aquifer
Components/compounds	:	Extraction rate of wells, natural recharge
Spatial resolution		
Discretization	:	variable
Dimension	:	$2^1/_2$ D
Length scale	:	variable
Application scale	:	local
Temporal resolution		
Timestep	:	variable
Calculation timestep	:	user defined
Output timestep	:	user defined
Input data	:	Extraction rates of wells at various sites, hydraulic conductivity, porosity, aquifer size, several types of natural recharge
Output data	:	print file of X, Y and Z coordinates of particle position at time instant T; plot file containing GTI code for particle trajectories
User interface		
Operation	:	Batch
Communication language	:	English
Computer code		
Programming language	:	FORTRAN 77
Comment language	:	English
Runtime	:	1 minute (for 1 well and 10 pathlines) to several hours (for several tens of wells) on 386 PC

6. STATUS

Final working version ?	:	yes Version no.: 3.09 (1-2-1991)
SOP	:	yes SOP no.: LBG/812
User's guide	:	yes
Tech. ref. manual	:	yes
Application reports	:	yes
Under development?	:	no

7. AVAILABILITY

Available outside RIVM?	:	yes
User contract mandatory?	:	no
Costs	:	commercial price

8. DOCUMENTATION

Lieste, R., 1989. Computer Program FLOPZ1, Pathlines in Quasi-Three-Dimensional Groundwater Flow in a Layered Homogeneous Aquifer. RIVM Report no. 728520005.

1. NAME OF THE MODEL : **FLOPZN**

2. CONTACT IN RIVM

Name : E.J.M. Veling
Laboratory : CWM
Phone : 030-742072 Fax: 030-250740 Email: cwmedve@rivm

3. PURPOSE : Calculation of travel times and pathlines on a local scale in a hydrological system, consisting of aquifers, separated by semipermeable layers.

4. POLICY THEME : Acidification, desiccation, eutrophication

5. TECHNICAL SPECIFICATIONS

Processes : Solution of Laplace equation for determination of the groundwater potential. Determination of the velocity field by analytical derivatives.
Compartments : Maximal 10 aquifers separated by aquitards. Each aquifer consists of maximal 10 sublayers.
Components/compounds : water
Spatial resolution
Discretization : continuous
Dimension : 3D, the vertical dimension is approximative
Length scale : length scale: 10 - 5000 m
Application scale : local/regional
Temporal resolution
Timestep : days
Calculation timestep : variable, internally performed by the model
Output timestep : to be specified by the user
Input data : Thickness, permeability, porosity layers; thickness, resistance, porosity aquitards; location and strength extractions/infiltrations; boundary conditions.
Output data : Information about the particle tracking process, location at specified time instances.
User interface
Operation : Batch
Communication language : English
Computer code
Programming language : FORTRAN 77
Comment language : English
Runtime : 1 - 2.5 min. for a more complex problem on a PC-386.

6. STATUS

Final working version ? : yes Version no.: 2.10 (12-3-'91)
SOP : no SOP no.: -
User's guide : yes
Tech. ref. manual : no
Application reports : yes
Under development? : no

7. AVAILABILITY

Available outside RIVM? : yes
User contract mandatory? : yes
Costs : commercial price

8. DOCUMENTATION

Veling, E.J.M., 1988. Computer Program FLOPZN, Pathlines in Quasi-Three-Dimensional Groundwater Flow in a System of Layered Homogeneous Aquifers. RIVM Report no. 728520005.

1. NAME OF THE MODEL : **FLORAN**

2. CONTACT IN RIVM

Name	:	Gerard J.M. Uffink
Laboratory	:	LBG
Phone	:	030-743364 Fax: 030-292897

3. PURPOSE : Flow and transport model. Calculation of pathlines and travel times of water particles. Movement of a single soluble species in a horizontally layered aquifer.

4. POLICY THEME : Drinking water production, removal of radioactive waste

5. TECHNICAL SPECIFICATIONS

Processes	:	(quasi) 3D advective flow, dispersion, decay, sorption
Compartments	:	Confined aquifer.
Components/compounds	:	Groundwater. Soluble Contaminants.
Spatial resolution		
Discretization	:	none
Dimension	:	Quasi 3D velocity distribution; 3D solute transport.
Length scale	:	variable
Application scale	:	local, regional
Temporal resolution		
Timestep	:	variable
Calculation timestep	:	user defined
Output timestep	:	user defined
Input data	:	Flow data, aquifer data, solute data, calculation control parameters
Output data	:	File with raw output data (time and coordinates of particle trajectories). Post-processor (POSFLOR) evaluates raw output data and creates plots on screen (PC): - maps with flow-pattern and contaminant plume - maps with contours of iso-concentration lines - breakthrough curves at given location in the aquifer or in pumping well. Screen plots may be printed via screen-dump facility.
User interface		
Operation	:	Interactive menu-driven pre- and post-processor.
Communication language	:	English.
Computer code		
Programming language	:	C (ANSI) and FORTRAN 77
Comment language	:	English
Runtime	:	minute to hours (problem and computer dependent)

6. STATUS

Final working version ?	:	yes Version no.: ?
SOP	:	yes SOP no.: LBG/811
User's guide	:	yes
Tech. ref. manual	:	no
Application reports	:	yes
Under development?	:	yes

7. AVAILABILITY

Available outside RIVM?	:	yes
User contract mandatory?	:	yes
Costs	:	fl 2000.--

8. DOCUMENTATION

Documentation FLORAN???

1. NAME OF THE MODEL : **FLSTAT**

2. CONTACT IN RIVM

Name : Roland Lieste
Laboratory : LBG
Phone : 030-743407 Fax: 030-292897

3. PURPOSE : Two-Dimensional calculation of pathlines and travel times of groundwater particles based on the discrete values of the hydraulic head in a heterogeneous and unconfined aquifer

4. POLICY THEME : drinking water production, dispersion

5. TECHNICAL SPECIFICATIONS

Processes : The movement of a water particle in a saturated phreatic aquifer, due to the gradient of hydraulic head. Darcy's law.
Compartments : Fully saturated phreatic aquifer.
Components/compounds : hydraulic heads
Spatial resolution
Discretization : variable
Dimension : 2D
Length scale :
Application scale : regional
Temporal resolution
Timestep : variable
Calculation timestep : variable
Output timestep : variable
Input data : spatially rectangular distributed hydraulic heads, conductivity, porosity
Output data : print and plot (GTI) files containing coordinates of water particles at various time instants
User interface
Operation : Batch
Communication language : English
Computer code
Programming language : FORTRAN 77
Comment language : English
Runtime : 1 minute to several hours on 386 PC

6. STATUS

Final working version ? : yes Version no.: 2.16 (8-2-1989)
SOP : yes SOP no.: LBG/813
User's guide : yes
Tech. ref. manual : yes
Application reports : yes
Under development? : no

7. AVAILABILITY

Available outside RIVM? : yes
User contract mandatory? : yes
Costs : commercial price

8. DOCUMENTATION

Lieste, R., 1989. Computer Program FLSTAT; Pathlines in Two-Dimensional Groundwater flow in a Heterogeneous Aquifer. RIVM Report no. 728520003.
Beugelink, G.P. & H. Snelting, 1989. Berekening van intrekgebieden eenvoudig met FLSTAT. H_2O 22, 300-302.

1. NAME OF THE MODEL : **FORSKA**

2. CONTACT IN RIVM

Name : R. Leemans
Laboratory : MTV
Phone : 030-743377 Fax: 030-292897 Email: mobirik@rivm.nl

3. PURPOSE : Forest succession model. The model is developed to describe the succesStion of single and multi-species forest stands by simulating establishment, growth and mortality of individual trees.

4. POLICY THEME : Climate change

5. TECHNICAL SPECIFICATIONS

Processes : Establishment, growth and mortality of individual trees
Compartments : Individual tree: tree species: canopy structure: patch: forest stand
Components/compounds : individual tree
Spatial resolution
Discretization : variable (0.1ha to large landscapes)
Dimension : 0D (patches are not arranged in a spatial order)
Length scale :
Application scale : local / regional
Temporal resolution
Timestep : variable
Calculation timestep : 1 year
Output timestep : 20 years (Default)
Input data : Silvicultural Species Characteristics
Output data : Forest Stand Description
User interface
Operation : Batch
Communication language : English
Computer code
Programming language : FORTRAN 77
Comment language : English
Runtime : 1 min. for a forest stand of 1 ha and age of 200 years on SUN-IPC

6. STATUS

Final working version ? : yes Version no.: -
SOP : no SOP no.: -
User's guide : yes
Tech. ref. manual : yes
Application reports : yes
Under development? : yes

7. AVAILABILITY

Available outside RIVM? : yes
User contract mandatory? : no
Costs : handling costs

8. DOCUMENTATION

Leemans, R., 1991. Sensitivity analysis of a forest succession model. Ecological Modelling 53, 247-262.
Leemans, R., 1992. Simulation and future projection of succession in a Swedish broad-leaved forest. Forest Ecology and Management 48, 305-319.
Leemans, R. & I.C. Prentice, 1989. FORSKA, a General Forest Succession Model. Meddelanden från Växtbiologiska Institutionen, 89/2, Uppsala, Sweden.
Prentice, I.C. & R. Leemans, 1990. Pattern and process and the dynamics of forest structure. J. Ecol. 78, 340-355.
Prentice, I.C., M.T. Sykes & W. Cramer, 1993. A simulation model for the transient effects of climate change on forest landscapes. Ecological Modelling 65, 51-70.

1. NAME OF THE MODEL : **GEOMAN**

2. CONTACT IN RIVM

Name	:	J.-P. Hettelingh
Laboratory	:	MTV
Phone	:	030 - 743048

3. PURPOSE : Manipulation and display of geographical data stored in DBASE format (see also RAINS and CRITLO)

4. POLICY THEME : Acidification

5. TECHNICAL SPECIFICATIONS

Processes	:	Numerical
Compartments	:	Geographic
Components/compounds	:	Any
Spatial resolution		
Discretization	:	variable
Dimension	:	2D
Length scale	:	
Application scale	:	regional /continental global
Temporal resolution		
Timestep	:	-
Calculation timestep	:	-
Output timestep	:	-
Input data	:	any geographical data
Output data	:	geographical displays of (manipulated) input data
User interface		
Operation	:	Interactive
Communication language	:	English
Computer code		
Programming language	:	C
Comment language	:	English
Runtime	:	seconds

6. STATUS

Final working version ?	:	yes Version no.: -
SOP	:	no SOP no.: -
User's guide	:	no
Tech. ref. manual	:	no
Application reports	:	yes
Under development?	:	yes

7. AVAILABILITY

Available outside RIVM?	:	yes, developed at IIASA, Laxembourg, Austria
User contract mandatory?	:	-
Costs	:	Contact IIASA.

8. DOCUMENTATION

Applied for scientific publications.

1. NAME OF THE MODEL : **Holdridge Life Zone Classification**

2. CONTACT IN RIVM

Name : R. Leemans
Laboratory : MTV
Phone : 030-743377 Fax: 030-292897 Email: mobirik@rivm.nl

3. PURPOSE : To calculate a climate classification, which can be used to delimit global vegetation zones. The model is used to simulate changes in extent and carbon content on a global scale

4. POLICY THEME : Climate change

5. TECHNICAL SPECIFICATIONS

Processes : Climate - vegetation correlations
Compartments : -
Components/compounds : -
Spatial resolution
Discretization : variable (default is 0.5 degree longitude and latitude)
Dimension : 2D
Length scale : 0.5 degree longitude and latitude
Application scale : continental / global
Temporal resolution
Timestep : -
Calculation timestep : -
Output timestep : -
Input data : Monthly temperature and precipitation values
Output data : Life Zone classes
User interface
Operation : Batch
Communication language : English
Computer code
Programming language : FORTRAN 77
Comment language : English
Runtime : 5 minutes for a global application on a SUN-IPC workstation

6. STATUS

Final working version ? : yes Version no.:
SOP : no SOP no.: -
User's guide : no
Tech. ref. manual : yes
Application reports : yes
Under development? : no

7. AVAILABILITY

Available outside RIVM? : yes
User contract mandatory? : no
Costs : handling costs

8. DOCUMENTATION

Cramer, W. & R. Leemans, 1991. Assessing impacts of climate change on vegetation using climate classification systems. In: H.H. Shugart & A.M. Solomon (Eds), Vegetation dynamics modelling and global change. Chapman-Hall, New York, pp. 190-217.

Leemans, R. & W.P. Cramer, 1991. The IIASA database for mean monthly values of temperature, precipitation and cloudiness on a global terrestrial grid. RR-91-18, Internat. Ins. of Applied Systems Analyses, Laxenburg.

Monserud, R.A. & R. Leemans, 1992. The comparison of global vegetation maps. Ecological Modelling 62, 275-293.

1. NAME OF THE MODEL : **IMAGE 1** (Integrated Model to Assess the Greenhouse Effect)

2. CONTACT IN RIVM

Name	:	J. Alcamo, J. Rotmans
Laboratory	:	MTV, CWM
Phone	:	030-743704

3. PURPOSE : Analysis at scenarios for managing the greenhouse effect

4. POLICY THEME : Climate change

5. TECHNICAL SPECIFICATIONS

Processes	:	emissions, atmospheric, chemical conversions, depositions, biological
Compartments	:	atmosphere, ocean, terrestrial biosphere
Components/compounds	:	CO_2, CFK a.o.
Spatial resolution		
Discretization	:	fixed
Dimension	:	0D
Length scale	:	-
Application scale	:	global
Temporal resolution		
Timestep	:	fixed
Calculation timestep	:	few months - 1 year
Output timestep	:	few months - 1 year
Input data	:	
Output data	:	time series of emissions, concentrations, temperature, sea level rise
User interface		
Operation	:	Interactive (MS-Windows version available)
Communication language	:	English
Computer code		
Programming language	:	FORTRAN
Comment language	:	English
Runtime	:	variable, depending on computer and simulation time

6. STATUS

Final working version ?	:	yes	Version no.: 1.0
SOP	:	no	SOP no.: -
User's guide	:	yes	
Tech. ref. manual	:	yes	
Application reports	:	yes	
Under development?	:	no	

7. AVAILABILITY

Available outside RIVM?	:	yes
User contract mandatory?	:	no
Costs	:	handling costs

8. DOCUMENTATION

Rotmans, J., 1990. IMAGE. Kluwer, Dordrecht.

1. NAME OF THE MODEL : **IMAGE 2** (Integrated Model to Assess the Greenhouse Effect)

2. CONTACT IN RIVM

Name : J.M. Alcamo
Laboratory : MTV
Phone : 030-743487 Fax: 030-250740 Email: mobijoe@rivm.nl

3. PURPOSE : Evaluation of consequences of climate policies, and investigation of linkages and feedbacks of the society-biosphere-climate system.

4. POLICY THEME : Global change, Climate change

5. TECHNICAL SPECIFICATIONS

Processes : Ecological dynamics, atmospheric dynamics, ocean dynamics
Compartments : atmosphere-ocean, terrestrial environment, energy
Components/compounds : Greenhouse gases, temperature, precipitation, emissions
Spatial resolution
Discretization : fixed (0.5° latitude & longitude)
Dimension : 0D - 2D
Length scale : km
Application scale : global, regional, local
Temporal resolution
Timestep : fixed
Calculation timestep : 1 day - 5 year
Output timestep : 1 - 5 year
Input data : Global databases (soil, climate, land cover etc.), population, GNP, energy prices etc.
Output data : Emissions, land cover, climate, temperature, precipitation, concentrations
User interface
Operation : Batch
Communication language : English
Computer code
Programming language : FORTRAN
Comment language : English
Runtime : 2.5 days for the fully linked model form 1970 to 2100 on a Sun IPX Workstation.

6. STATUS

Final working version ? : yes Version no.: 2.0
SOP : no SOP no.: -
User's guide : no
Tech. ref. manual : no
Application reports : Under development
Under development? : yes

7. AVAILABILITY

Available outside RIVM? : For collaborating groups
User contract mandatory? : Collaboration agreement
Costs : n.a.

8. DOCUMENTATION

In: Water Air and Soil Pollution, (Subm.), Special Issue:
Alcamo, J., G.J.J. Kreileman, M. Krol & G. Zuidema, 1994. Modelling the Global Society-Biosphere-Climate System. Part 1: Model Description and Testing.
Alcamo, J., G.J. van den Born, A.F. Bouwman, B. de Haan, K. Klein Goldewijk, O. Klepper, R. Leemans, J.A. Olivier, H.J.M. de Vries, H. van der Woerd & R. van den Wijngaart, 1994. Modelling the Global Society-Biosphere-Climate System. Part 2: Computed Scenarios.

1. NAME OF THE MODEL : **Iodine prophylaxis**

2. CONTACT IN RIVM

Name : H. Slaper
Laboratory : LSO
Phone : 030-743488 Fax: 030-291604

3. PURPOSE : Calculation of the relative dose reduction effects of iodine prophylaxis during the passage of a radioactive cloud

4. POLICY THEME : nuclear accidents

5. TECHNICAL SPECIFICATIONS

Processes : physiological model for inhalation and ingestion of iodine (according to ICRP-model)
Compartments : air
Components/compounds : several compartments in lung-model and ingestion path
Spatial resolution
Discretization : -
Dimension : 0D
Length scale : -
Application scale : local
Temporal resolution
Timestep : variable
Calculation timestep : variable; hours normally
Output timestep : variable; hours normally
Input data : nuclide, half lifetime; duration of radioactive cloud passage, timestep
Output data : Thyroid dose reduction in relation to time of profylaxis
User interface
Operation : Batch
Communication language : Dutch
Computer code
Programming language : Turbo Pascal
Comment language : Dutch
Runtime : < 1 min

6. STATUS

Final working version ? : no Version no.: -
SOP : no SOP no.: -
User's guide : no
Tech. ref. manual : no
Application reports : no
Under development? : no

7. AVAILABILITY

Available outside RIVM? : no
User contract mandatory? : -
Costs : -

8. DOCUMENTATION

None.

1. NAME OF THE MODEL : **IT** (Information system on environmental Technologies)

2. CONTACT IN RIVM

Name	:	C.J. Peek / K. Visscher
Laboratory	:	LAE
Phone	:	030-743623 / 743041 Fax: 030-293651

3. PURPOSE : To retrieve, from technique descriptions, information which can play a decision support role in solving environmental problems

4. POLICY THEME : -

5. TECHNICAL SPECIFICATIONS

Processes	:	-
Compartments	:	air, soil, waste, water
Components/compounds	:	contaminents
Spatial resolution		
Discretization	:	-
Dimension	:	-
Length scale	:	-
Application scale	:	-
Temporal resolution		
Timestep	:	-
Calculation timestep	:	-
Output timestep	:	-
Input data	:	keyword(s)
Output data	:	information which can play a decision support role in solving environmental problems
User interface		
Operation	:	Interactive
Communication language	:	Dutch
Computer code		
Programming language	:	BRS/MNS
Comment language	:	English
Runtime	:	A few seconds

6. STATUS

Final working version ?	:	yes	Version no.: 2
SOP	:	no	SOP no.: -
User's guide	:	yes	
Tech. ref. manual	:	yes	
Application reports	:	no	
Under development?	:	no	

7. AVAILABILITY

Available outside RIVM?	:	restricted to DGM, RIZA
User contract mandatory?	:	-
Costs	:	-

8. DOCUMENTATION

Bruinsma, P.H., K. Visscher & A.C.F. Wiering, 1989. Definition-study report IT. RIVM Report no. 738705002.
Bruinsma, P.H., K. Visscher & A.C.F. Wiering, 1989. Global/Detailed-design report IT. RIVM Report no.738705003.
Bruinsma, P.H., K. Visscher & A.C.F. Wiering, 1989. User's manual IT. RIVM Report no. 738705004.
Wiering, A.C.F. & J. Joziasse, 1990. Evaluation report IT. RIVM Report no. 738705005.
Peek, C.J., 1991. Global/Detailed-design The use of IT, version 2. RIVM Report no. 736101011.
Peek, C.J., 1991. User's manual IT, Version 2. RIVM Report no. 736101012.

1. NAME OF THE MODEL : **Köppen Climate Classification**

2. CONTACT IN RIVM

Name	:	R. Leemans
Laboratory	:	MTV
Phone	:	030-743377 Fax: 030-292897 Email: mobirik@rivm.nl

3. PURPOSE : The Köppen Climate Classification can be used to delimit global vegetation zones.

4. POLICY THEME : Climate Change

5. TECHNICAL SPECIFICATIONS

Processes	:	Climate Vegetation Correlations
Compartments	:	-
Components/compounds	:	-
Spatial resolution		
Discretization	:	variable (Default is 0.5 degree longitude and latitude)
Dimension	:	2D
Length scale	:	0.5 degree longitude and latitude
Application scale	:	continental / global
Temporal resolution		
Timestep	:	n.a.
Calculation timestep	:	n.a.
Output timestep	:	n.a.
Input data	:	Monthly temperature and precipitation values
Output data	:	Life Zone classes
User interface		
Operation	:	Batch
Communication language	:	English
Computer code		
Programming language	:	FORTRAN 77
Comment language	:	English
Runtime	:	5 minutes for a global application on a SUN-IPC workstation

6. STATUS

Final working version ?	:	yes Version no.:
SOP	:	no SOP no.: -
User's guide	:	no
Tech. ref. manual	:	no
Application reports	:	yes
Under development?	:	no

7. AVAILABILITY

Available outside RIVM?	:	yes
User contract mandatory?	:	no
Costs	:	handling costs

8. DOCUMENTATION

Cramer, W. & R. Leemans, 1991. Assessing impacts of climate change on vegetation using climate classification systems. In: H.H. Shugart & A.M. Solomon (eds), Vegetation dynamics modelling and global change. Chapman-Hall, New York, pp. 190-217.

Guetter, P.J. & J.E. Kutzbach, 1990. A modified Köppen classification applied to model simulations of glacial and interglacial climates. Climatic Change 16, 193-215.

Leemans, R., J.G. van Minnen & W.P. Cramer, 1994. Prediction of global biome distribution using bioclimatic equilibrium models. In: Melillo, J.M.(ed.), Global Change: Impacts on Coniferous Forests and Grasslands. J. Wiley and Sons, New York, in press.

1. NAME OF THE MODEL : **LGM** (Landelijk Grondwater Model)

2. CONTACT IN RIVM
- **Name** : Rien Pastoors, Roland Lieste
- **Laboratory** : LBG
- **Phone** : 030-743353, 030-743407. Fax: 030-292897

3. PURPOSE : calculation of regional transport of groundwater in the Netherlands. Dedicated implementation of AQ software, ARC-INFO and specific interface software.

4. POLICY THEME : Drinking water production, dessication

5. TECHNICAL SPECIFICATIONS
- **Processes** : groundwater transport
- **Compartments** : four aquifers and top system, the Netherlands is subdivided into ten sub-regions
- **Components/compounds** :
- **Spatial resolution**
  - **Discretization** : variable
  - **Dimension** : quasi 3D
  - **Length scale** :
  - **Application scale** : regional / fluvial
- **Temporal resolution**
  - **Timestep** : -
  - **Calculation timestep** : based on AQ software
  - **Output timestep** : based on AQ software
- **Input data** : based on AQ software
- **Output data** : based on AQ software
- **User interface**
  - **Operation** : Interactive
  - **Communication language** : Dutch and English
- **Computer code**
  - **Programming language** : FORTRAN 77
  - **Comment language** : English and Dutch
- **Runtime** :

6. STATUS
- **Final working version ?** : no Version no.: -
  - **SOP** : no SOP no.: -
  - **User's guide** : yes
  - **Tech. ref. manual** : yes
  - **Application reports** : yes
- **Under development?** : yes

7. AVAILABILITY
- **Available outside RIVM?** : no
- **User contract mandatory?** : -
- **Costs** : -

8. DOCUMENTATION

Kovar, K., A. Leijnse & J.B.S. Gan. 1992. Groundwater Model for the Netherlands. Mathematical model development and user's guide. RIVM Report no. 714305002.

1. NAME OF THE MODEL : M

2. CONTACT IN RIVM
- **Name** : A.J. de Bruin
- **Laboratory** : ISC
- **Phone** : 030 - 743860

3. PURPOSE : Modelling tool for the development and visualization of dynamic models for the exploration of environmental and public health policies

4. POLICY THEME : all

5. TECHNICAL SPECIFICATIONS
- **Processes** : to be specified by the user
- **Compartments** :
- **Components/compounds** :
- **Spatial resolution**
  - **Discretization** : variable
  - **Dimension** : variable
  - **Length scale** :
  - **Application scale** : variable
- **Temporal resolution**
  - **Timestep** : variable
  - **Calculation timestep** : variable
  - **Output timestep** : variable
- **Input data** : ASCII (specific format)
- **Output data** : ASCII (idem)
- **User interface**
  - **Operation** : Interactive & batch
  - **Communication language** : english
- **Computer code**
  - **Programming language** : C
  - **Comment language** : english
- **Runtime** :

6. STATUS
- **Final working version ?** : no Version no.: 2.0
  - **SOP** : no SOP no.: -
  - **User's guide** : yes
  - **Tech. ref. manual** : yes
  - **Application reports** : no
- **Under development?** : yes

7. AVAILABILITY
- **Available outside RIVM?** : yes
- **User contract mandatory?** : yes
- **Costs** : to be announced

8. DOCUMENTATION

Van Wijk, J., 1993. M Language Reference Manual. RIVM, Internal report.
Van Wijk, J., 1993. M Language Tutorial. RIVM, Internal report.
De Vink, P., 1993. Graphical Reference Manual. RIVM, in prep.

1. NAME OF THE MODEL : MASCOT

2. CONTACT IN RIVM

Name	:	Gerard J.M. Uffink
Laboratory	:	LBG
Phone	:	030-743364 Fax: 030-292897

3. PURPOSE : Transport of a Four-Member Radionuclide Decay Chain in Groundwater.

4. POLICY THEME : Removal of radioactive waste, dispersion

5. TECHNICAL SPECIFICATIONS

Processes	:	Advection, dispersion/diffusion (2D or 3D), sorption, decay, nuclide release, safety assessment.
Compartments	:	Confined aquifer with uniform groundwater flow. Repository with nuclear waste.
Components/compounds	:	Groundwater. Four member chain of radionuclides.
Spatial resolution		
Discretization	:	none
Dimension	:	2D or 3D
Length scale	:	variable
Application scale	:	local/regional
Temporal resolution		
Timestep	:	variable
Calculation timestep	:	user defined
Output timestep	:	user defined
Input data	:	(uniform) groundwater flow; information on aquifer, nuclides, and release of nuclides
Output data	:	nuclide concentration distribution,
User interface		
Operation	:	Batch. Implementation on PC or main-frame
Communication language	:	English.
Computer code		
Programming language	:	FORTRAN 77
Comment language	:	English
Runtime	:	minute to hours (problem and computer dependent)

6. STATUS

Final working version ?	:	yes Version no.:
SOP	:	yes SOP no.: LBG/810
User's guide	:	yes
Tech. ref. manual	:	yes
Application reports	:	yes
Under development?	:	yes

7. AVAILABILITY

Available outside RIVM?	:	Distribution by NEA Data BANK, Paris, France.
User contract mandatory?	:	-
Costs	:	-

8. DOCUMENTATION

Gureghian, A.B., 1987. Analytical solutions for multidimensional transport of a four-member radionuclide decay chain in groundwater. Technical Report BMI/OCRD-25 Distribution Cat. UC-70 Battelle, Columbus Ohio.
Gureghian, A.B., 1988. MASCOT USER'S GUIDE. Version 2.0. Analytical solutions for multidimensional transport of a four-member radionuclide decay chain in groundwater. Technical Report BMI/OCRD-30. Distribution Cat. UC-70, Battelle, Columbus, Ohio.

1. NAME OF THE MODEL : **Meccano**

2. CONTACT IN RIVM

Name	:	Wil Vrijsen
Laboratory	:	CWM
Phone	:	030-742069

3. PURPOSE : to support policy makers, composing a package of proposed measures to improve the environmental hygiene in the Netherlands, cost-effect relations are archived and presented in an ordered graphical way

4. POLICY THEME : in principle all

5. TECHNICAL SPECIFICATIONS

Processes	:	
Compartments	:	
Components/compounds	:	
Spatial resolution		
Discretization	:	
Dimension	:	0D
Length scale	:	
Application scale	:	national
Temporal resolution		
Timestep	:	
Calculation timestep	:	
Output timestep	:	
Input data	:	cost-effect relations
Output data	:	accumulated cost-effect curves and histograms
User interface		
Operation	:	Interactive
Communication language	:	Dutch
Computer code		
Programming language	:	Ansi C
Comment language	:	Dutch
Runtime	:	1 sec

6. STATUS

Final working version ?	:	yes	Version no.: 1
SOP	:	no	SOP no.: -
User's guide	:	yes	
Tech. ref. manual	:	yes	
Application reports	:	no	
Under development?	:	yes	

7. AVAILABILITY

Available outside RIVM?	:	no
User contract mandatory?	:	-
Costs	:	-

8. DOCUMENTATION

Vrijsen, W., 1993. Meccano: modelbeschrijving en handleiding, CWM-memo 010/93.

1. NAME OF THE MODEL : **METLAN** (METalen LANdbouwgrond)

2. CONTACT IN RIVM

Name	:	J.A. Annema
Laboratory	:	LAE
Phone	:	030-743680

3. PURPOSE : Calculation of the emission of heavy metals to agricultural soils

4. POLICY THEME : Dispersion of toxic substances

5. TECHNICAL SPECIFICATIONS

Processes	:	Multiplication of amount of manure, sludge, fertilizer and pesticides with concentrations of heavy metals
Compartments	:	soil
Components/compounds	:	Heavy metals; manure; sludge etc.
Spatial resolution		
Discretization	:	-
Dimension	:	2D
Length scale	:	hectares
Application scale	:	local / regional
Temporal resolution		
Timestep	:	-
Calculation timestep	:	-
Output timestep	:	-
Input data	:	Concentration of heavy metals and amount of manure sludge, etc.
Output data	:	Tonnes of heavy metals emitted per year
User interface		
Operation	:	Interactive
Communication language	:	Dutch
Computer code		
Programming language	:	Lotus 1-2-3
Comment language	:	-
Runtime	:	seconds

6. STATUS

Final working version ?	:	no	Version no.: -
SOP	:	no	SOP no.: -
User's guide	:	no	
Tech. ref. manual	:	no	
Application reports	:	no	
Under development?	:	yes	

7. AVAILABILITY

Available outside RIVM?	:	no
User contract mandatory?	:	no
Costs	:	-

8. DOCUMENTATION

None

1. NAME OF THE MODEL : **METROPOL**

2. CONTACT IN RIVM

Name	:	Arthur Beusen
Laboratory	:	CWM
Phone	:	030-742367

3. PURPOSE : simulation of groundwater flow and transport of contaminants by groundwater

4. POLICY THEME : removal

5. TECHNICAL SPECIFICATIONS

Processes	:	groundwater flow, advection, dispersion, decay, adsorption.
Compartments	:	soil
Components/compounds	:	groundwater, dissolved contaminants
Spatial resolution		
Discretization	:	variable
Dimension	:	3D
Length scale	:	variable
Application scale	:	local / regional
Temporal resolution		
Timestep	:	variable
Calculation timestep	:	variable
Output timestep	:	variable
Input data	:	soil parameters, sorption/decay characteristics of contaminant, initial/boundary conditions for flow and for concentrations
Output data	:	hydraulic heads, streamlines, concentrations of contaminants
User interface		
Operation	:	Batch
Communication language	:	English
Computer code		
Programming language	:	FORTRAN 77
Comment language	:	English
Runtime	:	problem dependent

6. STATUS

Final working version ?	:	yes	Version no.: -
SOP	:	no	SOP no.: -
User's guide	:	yes	
Tech. ref. manual	:	yes	
Application reports	:	yes	
Under development?	:	no	

7. AVAILABILITY

Available outside RIVM?	:	yes
User contract mandatory?	:	yes
Costs	:	hfl 5000.=

8. DOCUMENTATION

Sauter, F., A. Leijnse & A. Beusen, 1993. METROPOL, User's guide. RIVM report no. 725205003.
Sauter, F., 1987. User's manual METROPOL, Mathematical description. RIVM report no. 728514002.
Sauter, F., M. Hassanizadeh, A. Leijnse, P. Glasbergen & A. Slot, 1990. METROPOL, a computer code for the simulation of transport of contaminants with groundwater, European Communities Commission, EUR 13073, Luxembourg.

1. NAME OF THE MODEL : **MiniBIOS**

2. CONTACT IN RIVM

Name	:	G.M.H. Laheij
Laboratory	:	LSO
Phone	:	030-743829 Fax: 030-291604

3. PURPOSE : MiniBIOS is a simple compartment model, designed to calculate the transfer of radionuclides in the biosphere and the resulting radiation dose.

4. POLICY THEME : Dispersion

5. TECHNICAL SPECIFICATIONS

Processes	:	transport, sedimentation, diffusion, bioturbation, irrigation and plant uptake
Compartments	:	rivers, lakes and seas (with their sediments), soil, plants and animals
Components/compounds	:	radionuclides
Spatial resolution		
Discretization	:	fixed
Dimension	:	3D
Length scale	:	km
Application scale	:	local
Temporal resolution		
Timestep	:	variable
Calculation timestep	:	> 1 year
Output timestep	:	> 1 year
Input data	:	source terms, nuclide dependent parameters, (e.g. transfer coefficients, decay rates), biosphere parameters, (e.g. length of river, area of arable land, irrigation rates).
Output data	:	concentrations in compartments, individual dose to man
User interface		
Operation	:	Batch
Communication language	:	English
Computer code		
Programming language	:	FORTRAN 77, FACSIMILE
Comment language	:	English
Runtime	:	< 1 minute per nuclide on a HP 9000 computer

6. STATUS

Final working version ?	:	yes Version no.: 1A5
SOP	:	yes SOP no.: LSO/P/083
User's guide	:	yes
Tech. ref. manual	:	yes
Application reports	:	yes
Under development?	:	no

7. AVAILABILITY

Available outside RIVM?	:	yes, model developed by NRPB (v. 1A), adapted by RIVM (v. 1A4)
User contract mandatory?	:	yes
Costs	:	-

8. DOCUMENTATION

Martin, J.S., S.F. Mobbs, R.A. Klos & I.M. Barraclough, 1991. User guide for the code MiniBIOS_1A. NRPB-M283.

Uijt de Haag, P.A.M. & G.M.H. Laheij, 1993. The MiniBIOS model (version 1A4) at the RIVM. RIVM Report no. 715204004.

1. NAME OF THE MODEL : **MKM** (Module of Environmental Information and planning model to calculate environmental costs

2. CONTACT IN RIVM

Name : Z.I. van Lohuizen, W. Laan
Laboratory : LAE
Phone : 030-743024 Fax:030-293651 Email: laewl@rivm.nl

3. PURPOSE : Calculation of environmental costs of emission-, waste- and energy-projections for several future years. The projections are based upon economic, demographic and other general scenarios. It is possible to choose different policy abatements, so one can examine the cost-effectiveness of measures.

4. POLICY THEME : all

5. TECHNICAL SPECIFICATIONS

Processes : the model is to be considered as a administration and calculation tool: only simple multiplication and addition operations
Compartments : air, water, soil, waste
Components/compounds : all chemical compounds; all waste materials
Spatial resolution
Discretization : fixed
Dimension : 2D
Length scale : -
Application scale : regional
Temporal resolution
Timestep : flexible (min. 1 year)
Calculation timestep : min. 1 year
Output timestep : min. 1 year
Input data : activity levels for a list of economic sectors; economic scenarios for this sectors; possible measures and related costs, to reduce emission or waste-production.
Output data : bruto and netto costs, split into investments and operational costs; cost effectiveness curves per chemical compound.
User interface
Operation : Interactive
Communication language : English
Computer code
Programming language : Ingres Windows 4GL, C
Comment language : English, Dutch
Runtime : depends on many factors (1 to 5 minutes)

6. STATUS

Final working version ? : yes Version no.: 2.0
SOP : no SOP no.: -
User's guide : no (on-line help available)
Tech. ref. manual : yes
Application reports : no
Under development? : yes

7. AVAILABILITY

Available outside RIVM? : yes
User contract mandatory? : yes
Costs : -

8. DOCUMENTATION

None

1. NAME OF THE MODEL : **Model Metal Finishing**

2. CONTACT IN RIVM

Name : J.P.M. Ros
Laboratory : LAE
Phone : 030-743025 Fax: 030-293651

3. PURPOSE : To predict the results and the costs of a package of measures (in-process measures and/or end-of-pipe treatment) in metal finishing shops, especially metal plating.

4. POLICY THEME : distribution heavy metals, waste

5. TECHNICAL SPECIFICATIONS

Processes : the model is to be considered as calculation tool
Compartments : water, waste
Components/compounds : heavy metals, CN, SO4, oil/grease and others
Spatial resolution
Discretization : -
Dimension : -
Length scale : -
Application scale : -
Temporal resolution
Timestep : -
Calculation timestep : -
Output timestep : -
Input data : general data, model shop, package of measures
Output data : amounts of the most important components in effluent, sludge and concentrated solutions and the costs of the package of measures.
User interface
Operation : Interactive
Communication language : English
Computer code
Programming language : Turbo Pascal
Comment language : English
Runtime : -

6. STATUS

Final working version ? : yes Version no.: 2
SOP : no SOP no.: -
User's guide : yes
Tech. ref. manual : yes
Application reports : yes
Under development? : no

7. AVAILABILITY

Available outside RIVM? : yes
User contract mandatory? : yes
Costs : fl. 1750,-

8. DOCUMENTATION

Ros, J.P.M., 1989. MODEL METAL FINISHING, manual and description version 2. RIVM Report no. 738715001.

1. NAME OF THE MODEL : **MOSES** (Micro-environment Oriented System for Exposure Simulation

2. CONTACT IN RIVM

Name	:	A.E.M. de Hollander
Laboratory	:	CCM
Phone	:	030-743222

3. PURPOSE : Air pollution exposure assessment

4. POLICY THEME : Disturbance, dispersion, public health

5. TECHNICAL SPECIFICATIONS

Processes	:	Linking of activity patterns and concentration levels in micro-environments to assess human air pollution exposure
Compartments	:	ambiant air
Components/compounds	:	O_3, particulate matter, NO_2, Benzene, PAC's
Spatial resolution		
Discretization	:	fixed
Dimension	:	0D
Length scale	:	-
Application scale	:	local
Temporal resolution		
Timestep	:	variable
Calculation timestep	:	variable
Output timestep	:	variable
Input data	:	activity patterns, concentration levels
Output data	:	distribution of population exposure
User interface		
Operation	:	Interactive
Communication language	:	English
Computer code		
Programming language	:	MS-Excel spreadsheet, @Risk
Comment language	:	-
Runtime	:	approx. 15 min.

6. STATUS

Final working version ?	:	no	Version no.: -
SOP	:	no	SOP no.: -
User's guide	:	no	
Tech. ref. manual	:	no	
Application reports	:	no	
Under development?	:	yes	

7. AVAILABILITY

Available outside RIVM?	:	no
User contract mandatory?	:	-
Costs	:	-

8. DOCUMENTATION

None

1. NAME OF THE MODEL : **MOVE** (Multiple stress model for the vegetation)

2. CONTACT IN RIVM

Name	:	Joris B. Latour
Laboratory	:	LBG
Phone	:	030-743109 Fax: 030-292897

3. PURPOSE : Modelling the combined effect of acidification, eutrophication and desiccation on vegetation; setting of ecological standards.

4. POLICY THEME : acidification, eutrophication, desiccation

5. TECHNICAL SPECIFICATIONS

Processes	:	occurrence probability of 700 species for nitrogen availability, soil pH, soil moisture and salinity, described by means of gaussian logistic regression. (Model is linked to a dynamic soil model SMART of Winand Staring Centre.)
Compartments	:	one soil layer of variable size
Components/compounds	:	nitrogen, soil pH, soil mositure
Spatial resolution		
Discretization	:	fixed
Dimension	:	1D
Length scale	:	
Application scale	:	national (resolution of 1x1 sq. km)
Temporal resolution		
Timestep	:	fixed
Calculation timestep	:	yr
Output timestep	:	variable (d)
Input data	:	soil pH, soil nitrogen availability, soil moisture (input of SMART: nitrogen deposition, SO_2 deposition, groundwaterlevel, upward seepage of groundwater)
Output data	:	occurrence probability of species; ecological standards.
User interface		
Operation	:	Batch
Communication language	:	Dutch
Computer code		
Programming language	:	Pascal
Comment language	:	Dutch
Runtime	:	

6. STATUS

Final working version ?	:	yes	Version no.: 1
SOP	:	no	SOP no.: -
User's guide	:	yes	
Tech. ref. manual	:	no	
Application reports	:	yes	
Under development?	:	yes	

7. AVAILABILITY

Available outside RIVM?	:	no
User contract mandatory?	:	-
Costs	:	

8. DOCUMENTATION

Latour, J.B. & Reiling, R., 1993. MOVE: a multiple-stress model for vegetation. Sci. Tot. Environ., in press. RIVM Report no. 711901003(in Dutch).
Wiertz, J., Van Dijk, J. & Latour, J.B., 1992. De MOVE-vegetatie module: De kans op voorkomen van 700 plantesoorten als functie van vocht, pH, nutriënten en zout. RIVM Report no. 711901006.

1. NAME OF THE MODEL : **MPA**

2. CONTACT IN RIVM

Name	:	Liesbeth de Waal
Laboratory	:	LLO
Phone	:	030-742362 Fax: 030-287531

3. PURPOSE : trajectory model with non-linear atmospheric chemistry (CBM-IV mechanism) for calculation of formation and destruction of ozone in the boundary layer.

4. POLICY THEME : dispersion, summer smog forecasting

5. TECHNICAL SPECIFICATIONS

Processes	:	atmospheric transport, dispersion, deposition and non-linear tropospheric chemistry
Compartments	:	atmospheric boundary layer (2 levels up to max. ca. 3 km)
Components/compounds	:	O_3, VOC, NO_x, other oxidants (e.g. H_2O_2), various sec. products
Spatial resolution		
Discretization	:	variable along trajectory
Dimension	:	3D
Length scale	:	at arrival point ca. 25 km
Application scale	:	continental
Temporal resolution		
Timestep	:	variable: for each selected arrival time a full trajectory calculation have to be made
Calculation timestep	:	variable, in chemical integration module max 60 sec.
Output timestep	:	along trajectory every hour
Input data	:	(actual) meteorology, emission inventories over Europe of SO_2, NO_x, VOC and NH_3, distribution of sources. VOC emissions data.
Output data	:	concentration at one specific time for the specified receptor area.
User interface		
Operation	:	Interactive / Batch
Communication language	:	Dutch
Computer code		
Programming language	:	FORTRAN
Comment language	:	mixture of dutch and english
Runtime	:	ca. 5 min CPU (HP9000) for one 96h trajectory-run

6. STATUS

Final working version ?	:	yes	Version no.: 1.0
SOP	:	no	SOP no.: -
User's guide	:	yes	
Tech. ref. manual	:	no	
Application reports	:	yes	
Under development?	:	yes	

7. AVAILABILITY

Available outside RIVM?	:	no
User contract mandatory?	:	-
Costs	:	-

8. DOCUMENTATION

De Leeuw, F.A.A.M., *et al.*, 1990. Calculation of long term averaged ground level ozone concentrations. Atmospheric Environment 24A, 185- 193.

Van Rheineck Leyssius & De Leeuw, F.A.A.M., 1990. An air quality forecast system for photochemical smog episodes. In: H. van Dop & D.G. Steyn (eds), Air Pollution Modelling and its Application, Vol. XIII. Plenum Press, New York.

1. NAME OF THE MODEL : **Nationaal Model Vermesting**

2. CONTACT IN RIVM

Name : A.H. Bakema, K.F. de Boer
Laboratory : MTV
Phone : 030-743531 / 743530 Fax: 030-250740

3. PURPOSE : Predict the effects on soil and surface water of eutrophying substances (P and N), both from emissions and subsequent air tranport, as from runoff and leakage to surface and groundwater, as a result of fertilization.

4. POLICY THEME : Eutrophication

5. TECHNICAL SPECIFICATIONS

Processes : Emissions, transport, leaching, manure processes production, manure reallocation, fertilization
Compartments : air, surface water, soil, groundwater
Components/compounds : N, P, chicken, pig and cow manure
Spatial resolution
Discretization : Acidification areas, agricultural areas, surface water districts
Dimension : variable
Length scale : -
Application scale : national
Temporal resolution
Timestep : NA, steady state calculations
Calculation timestep : -
Output timestep : -
Input data : number of livestock, manure production, manure processing, emissions to air
Output data : Manure surplus, phosphate saturation of the soil, nitrate leaching to groundwater, surface water concentrations of nitrogen and phosphate
User interface
Operation : Interactive
Communication language : Dutch
Computer code
Programming language : Lotus 1-2-3
Comment language : Dutch
Runtime : depending on calculations: seconds to minutes on a PC-286

6. STATUS

Final working version ? : yes Version no.: 2.1
SOP : no SOP no.: -
User's guide : yes
Tech. ref. manual : no
Application reports : no
Under development? : no

7. AVAILABILITY

Available outside RIVM? : yes, the model was prepared by RPC (Resource Planning Consultants BV, Delft) by order of the Ministery of VROM, and was made available to all institutes participating in its construction
User contract mandatory? : -
Costs : -

8. DOCUMENTATION

User guide, including brief model description.

1. NAME OF THE MODEL : NLOAD

2. CONTACT IN RIVM
- Name : W.J. Willems
- Laboratory : LBG
- Phone : 030-743337

3. PURPOSE : Calculates nitrate leaching from agricultural soils

4. POLICY THEME : Eutrophication

5. TECHNICAL SPECIFICATIONS
- Processes : mineralisation; plant uptake; transport; leaching; emperical relations between leaching and load
- Compartments : soil
- Components/compounds : NO_3
- Spatial resolution
  - Discretization : fixed
  - Dimension : 1D
  - Length scale : 1 m
  - Application scale : local, regional
- Temporal resolution
  - Timestep : -
  - Calculation timestep : -
  - Output timestep : -
- Input data : N-load, manure, fertilizer, dung, soil type, nitrogen fractions (mineral-, organic-N), crop-type, net precipitation
- Output data : N-leaching flux at 1 m below surface level
- User interface
  - Operation : Batch
  - Communication language : English
- Computer code
  - Programming language : FORTRAN 77
  - Comment language : English
- Runtime : 1 min.

6. STATUS
- Final working version ? : yes Version no.: -
  - SOP : no SOP no.: -
  - User's guide : no
  - Tech. ref. manual : no
  - Application reports : yes
- Under development? : no

7. AVAILABILITY
- Available outside RIVM? : no
- User contract mandatory? : -
- Costs : -

8. DOCUMENTATION

Van Drecht, G. *et al.*, 1993. Berekening van de nitraatuitspoeling naar het grondwater m.b.v. eenvoudige modellen. RIVM Report no: 724901003.

Van Drecht, G., 1993. Berekening van de nitraatbelasting van het grondwater. Achtergronddocument bij de 2e nationale milieuverkenning.

Van Drecht, G., 1993. Modelling of regional scale nitrate leaching from agricultural soils, The Netherlands. In: Applied Geochemistry, Suppl. Issue, nr. 2, pp. 175-178.

1. NAME OF THE MODEL : **NPKRUN**

2. CONTACT IN RIVM

Name	:	C.R. Meinardi
Laboratory	:	LBG
Phone	:	030-743367 Fax: 030-292879

3. PURPOSE : To predict the leaching of diffuse pollutants (nitrogen phosphorus, potassium, brought in at the soil towards the draining (small) surface water at a regional scale.

4. POLICY THEME : Eutrofication

5. TECHNICAL SPECIFICATIONS

Processes	:	Physico-chemical processes (mixing); data manipulation by GIS methods, hydrological processes;
Compartments	:	Soil, water.
Components/compounds	:	Nitrogen, phosphorus, potassium, water
Spatial resolution		
Discretization	:	fixed
Dimension	:	2D / 3D
Length scale	:	km
Application scale	:	regional / fluvial
Temporal resolution		
Timestep	:	variable
Calculation timestep	:	10 years
Output timestep	:	fixed
Input data	:	hydrological data, soil load data
Output data	:	concentrations in surface water
User interface		
Operation	:	Batch
Communication language	:	English
Computer code		
Programming language	:	ARC/INFO; FORTRAN
Comment language	:	English
Runtime	:	several hours

6. STATUS

Final working version ?	:	yes Version no.: 2
SOP	:	no SOP no.: -
User's guide	:	no
Tech. ref. manual	:	no
Application reports	:	yes
Under development?	:	yes

7. AVAILABILITY

Available outside RIVM?	:	no
User contract mandatory?	:	no
Costs	:	handling costs

8. DOCUMENTATION

Meinardi, C.R., 1991. De stroom van voedingsstoffen (stikstof, fosfor, kalium) van de bodem naar het kleine open water. RIVM Report no. 724903004.

1. NAME OF THE MODEL : NUCLINS (NUCLear INStallations)

2. CONTACT IN RIVM
- Name : R.O. Blaauboer
- Laboratory : LSO
- Phone : 030-742645 Fax: 030-291604 Email: lsorob@krypton.rivm.nl

3. PURPOSE : To calculate individual, collective and maximum doses via several pathways (water, air, external exposure, ingestion, inhalation) during exposure of the Dutch population to regular discharges of nuclear installations in the Netherlands

4. POLICY THEME : Environmental management (nuclear installations)

5. TECHNICAL SPECIFICATIONS
- Processes : Contamination of foodchain/external exposure
- Compartments : Air, water, crop, soil
- Components/compounds : Discharged radioactive material
- Spatial resolution
  - Discretization : fixed
  - Dimension : 0D
  - Length scale : -
  - Application scale : regional
- Temporal resolution
  - Timestep : fixed
  - Calculation timestep : steady-state
  - Output timestep : dose per year
- Input data : Discharge rates of radionuclides from nuclear installations to air and to surface water
- Output data : discharge rates to air and water; dose conversion factors; effective individual and collective doses; compiled overview of all results
- User interface
  - Operation : Interactive
  - Communication language : Dutch
- Computer code
  - Programming language : Lotus 1-2-3, V3.0 spreadsheet
  - Comment language : Dutch
- Runtime : seconds on PC-386

6. STATUS
- Final working version ? : yes Version no.: -
  - SOP : no SOP no.: -
  - User's guide : no
  - Tech. ref. manual : yes
  - Application reports : yes
- Under development? : no

7. AVAILABILITY
- Available outside RIVM? : no
- User contract mandatory? : -
- Costs : -

8. DOCUMENTATION

The conversion matrices are derived from the STRAVE-project reports:

Blaauboer, R.O., L.H. Vaas & H.P. Leenhouts, 1991. Stralingsbelasting in Nederland in 1988. RIVM Report no. 249103001.

Van Hienen, J.F.A., P.M. Roelofsen, A..W. van Weer & A.D. Poley, 1990. Gevolgen van lozingen bij normaal bedrijf van nederlandse kerninstallaties. ECN Report no. ECN-C-90-015.

1. NAME OF THE MODEL : **NUCRED** (Nuclid Reduction)

2. CONTACT IN RIVM
- **Name** : H. Slaper
- **Laboratory** : LSO
- **Phone** : 030-743488 Fax: 030-291604

3. PURPOSE : The selection of major dose contributing nuclides in source terms from possible accidental releases from nuclear reactors; evaluation of deposition and air concentration related doses by means of ingestion, external exposure and inhalation

4. POLICY THEME : Risks from nuclear power plants

5. TECHNICAL SPECIFICATIONS
- **Processes** : inhalation, external exposure, atmospheric dispersion and deposition, interception by crops, soil plant transfer, grass/soil-cow-milk/meat, contamination of food, food consumption
- **Compartments** : air; soil (deposition)
- **Components/compounds** :
- **Spatial resolution**
  - **Discretization** : fixed / variable
  - **Dimension** : 0/1D
  - **Length scale** :
  - **Application scale** : regional / continental
- **Temporal resolution**
  - **Timestep** : fixed / variable
  - **Calculation timestep** : variable
  - **Output timestep** : evaluation period variable (> 1 year)
- **Input data** : source terms, dose-conversion factors, soil-plant transferfactors; soil characterisitics; food-consumption
- **Output data** : doses for various exposure pathways
- **User interface**
  - **Operation** : Interactive
  - **Communication language** : English
- **Computer code**
  - **Programming language** : Turbo Pascal
  - **Comment language** : Dutch
- **Runtime** : 30 sec.

6. STATUS
- **Final working version ?** : yes Version no.: 2.3
  - **SOP** : yes SOP no.: LSO/P/013
  - **User's guide** : yes
  - **Tech. ref. manual** : yes
  - **Application reports** : yes
- **Under development?** : yes

7. AVAILABILITY
- **Available outside RIVM?** : no
- **User contract mandatory?** : -
- **Costs** : -

8. DOCUMENTATION

Slaper, H., R.O. Blaauboer & G.J. Eggink, 1993. A risk assessment for accidental releases from nuclear power plants in Europe. RIVM Report no. 743030002.

Slaper H., Dosis berekening en selectie van dosisbepalende nucliden middels het programma NuclidRecductie: NUCRED version 2.3. Achtergronddocument opgenomen in logboek LSO/L/328.

1. NAME OF THE MODEL : **NUR-2** (NUclide Reduction)

2. CONTACT IN RIVM

Name : R.O. Blaauboer
Laboratory : LSO
Phone : 030-742645 Fax: 030-291604 Email: lsorob@krypton.rivm.nl

3. PURPOSE : Because a large number of radionuclides is released in a nuclear accident while an early evaluation of risks for the population is needed, a fast routine was needed to reduce the number of important radionuclides to the most important ones as far as risk is concerned.

4. POLICY THEME : Preparedness for nuclear accidents

5. TECHNICAL SPECIFICATIONS

Processes : Radiation dose due to cloud- and groundshine and due to inhalation
Compartments : Air, soilsurface
Components/compounds : 54 possible radionuclides
Spatial resolution
Discretization : fixed
Dimension : 0D
Length scale :
Application scale : local to regional
Temporal resolution
Timestep : variable
Calculation timestep : steady-state
Output timestep : variable
Input data : Discharge rates of radionuclides from nuclear accident to air
Output data : The output can be given in two ways:
a. Graphical: the 10 radionuclides that are most important
b. Tabulated: all 54 radionuclides in order of importance
User interface
Operation : Interactive
Communication language : Dutch
Computer code
Programming language : Lotus 1-2-3, V3.0 spreadsheet
Comment language : Dutch
Runtime : seconds on PC-386

6. STATUS

Final working version ? : yes Version no.: 2.0
SOP : yes SOP no.: LSO/P/081
User's guide : no
Tech. ref. manual : yes, LSO/KD/0191
Application reports : no
Under development? : no

7. AVAILABILITY

Available outside RIVM? : no
User contract mandatory? : -
Costs : -

8. DOCUMENTATION

Blaauboer, R.O., 1993. Nuclide-reductie module t.b.v. het Informatie en Documentatie Centrum (IDC) voor kernongevallenbestrijding. RIVM, Bilthoven. (LSO/KD/0191)

1. NAME OF THE MODEL : **Ocean Carbon Uptake Model**

2. CONTACT IN RIVM

Name	:	Olivier Klepper
Laboratory	:	CWM
Phone	:	030-743817

3. PURPOSE : Estimation of the carbon uptake by the oceans. The model may run together with Image 2.0.

4. POLICY THEME : Global change

5. TECHNICAL SPECIFICATIONS

Processes	:	Chemistry, physics, biology
Compartments	:	Ocean water
Components/compounds	:	
Spatial resolution		
Discretization	:	fixed, 10° latitude, 400 m depth.
Dimension	:	2D, zonally averaged in the horizontal dimension
Length scale	:	two connected branches 60° N to 65° S, representing the extend of the oceans, 4000 m deep
Application scale	:	global
Temporal resolution		
Timestep	:	variable
Calculation timestep	:	1 year
Output timestep	:	to be specified
Input data	:	atmospheric carbon dioxide concentration, temperature, ocean circulation rate, uv-intensity, river nutrient supply
Output data	:	atmosphere to ocean carbon dioxide flux, uv-damage, primary production by phytoplankton
User interface		
Operation	:	Batch
Communication language	:	English
Computer code		
Programming language	:	FORTRAN 77
Comment language	:	English
Runtime	:	short

6. STATUS

Final working version ?	:	yes	Version no.: 1
SOP	:	no	SOP no.: -
User's guide	:	no	
Tech. ref. manual	:	yes	
Application reports	:	yes	
Under development?	:	yes	

7. AVAILABILITY

Available outside RIVM?	:	no
User contract mandatory?	:	-
Costs	:	-

8. DOCUMENTATION

Klepper, O., 1993. Modelling the oceanic food web using a quasi steady state approach. CWM-memo 006/93. Ecological Modelling (in press)

Klepper, O. & B.J. de Haan, 1993. A sensitivity study of the effect of global change on ocean carbon uptake. To appear in Tellus.

Klepper, O., B.J. de Haan, P. Saager & M.S. Krol, 1994. Oceanic uptake of anthropogenic CO_2: mechanisms and modelling. RIVM Report, in press.

1. NAME OF THE MODEL : **OPS** (Operational Priority Substances)

2. CONTACT IN RIVM
- **Name** : Hans van Jaarsveld
- **Laboratory** : LLO
- **Phone** : 030-742818 Fax: 030-287531

3. PURPOSE : calculation of (long term average) concentration and deposition of inert or chemically less reactive components. Operational version of the TREND model

4. POLICY THEME : dispersion, acidification, eutrophication

5. TECHNICAL SPECIFICATIONS
- **Processes** : atmospheric transport, dispersion, deposition and (first order) chemical transformation.
- **Compartments** : atmospheric boundary layer (2 levels up to max. ca. 3 km)
- **Components/compounds** : chemically less reactive or inert gases or aerosols, e.g. heavy metals, benzene, dioxine, pesticides, SO_x, NO_x, NH_x, etc.
- **Spatial resolution**
  - **Discretization** : variable
  - **Dimension** : 3D
  - **Length scale** : from 100 m up to 150 km
  - **Application scale** : from local to continental
- **Temporal resolution**
  - **Timestep** : variable
  - **Calculation timestep** :
  - **Output timestep** : variable: one specific month to a 10-year averaged
- **Input data** : meteorological statistics; emissions; aerosol size distribution
- **Output data** : concentration and deposition fields
- **User interface**
  - **Operation** : Interactive / Batch
  - **Communication language** : both dutch and english version available
- **Computer code**
  - **Programming language** : FORTRAN
  - **Comment language** : dutch/english
- **Runtime** : depending on number of source/receptor combinations

6. STATUS
- **Final working version ?** : yes Version no.: V1.11 (Dutch) and V1.20E (English)
  - **SOP** : no SOP no.: -
  - **User's guide** : yes
  - **Tech. ref. manual** : no
  - **Application reports** : yes
- **Under development?** : no

7. AVAILABILITY
- **Available outside RIVM?** : yes
- **User contract mandatory?** : no
- **Costs** : handling costs

8. DOCUMENTATION

Van Jaarsveld, J.A., 1990. An operational atmospheric transport model for Priority Substances: specification and instructions for use. RIVM Report no. 228603008.
Van Jaarsveld, J.A. & De Leeuw, F.A.A.M, 1993. OPS: an operational atmospheric transport model for priority substances. Environmental Software 8, 91-100.

1. NAME OF THE MODEL : PCLAKE

2. CONTACT IN RIVM
- Name : J.H. Janse
- Laboratory : LWD
- Phone : 030 - 743136 Fax: 030 - 252066

3. PURPOSE : Simulation of the phosphorus, nitrogen and silica cycles, algal biomass and transparency in non-stratifying lakes

4. POLICY THEME : Eutrophication

5. TECHNICAL SPECIFICATIONS
- Processes : transport, chemical sorption, sediment-water exchange, primary, secundary and fish production, mineralization
- Compartments : Inorganic nutrients, detritus, algae (3x), zooplankton, benthos, fish (2x), submerged plants
- Components/compounds : DryWeight, P, N, Si
- Deterministic/stochastic : deterministic, stochastic is possible
- Spatial resolution
  - Discretization : fixed
  - Dimension : 1D (water + sediment)
  - Length scale : m - km
  - Application scale : local & regional
- Temporal resolution
  - Timestep : variable
  - Calculation timestep : days
  - Output timestep : variable, typically days or weeks
- Input data : water inflow, nutrient loading, temperature, dimensions, sediment characteristics, initial conditions of states
- Output data : concentrations/biomass of all states, fluxes, total P, total N, chlorophyll-a, transparency
- User interface
  - Operation : Interactive & Batch
  - Communication language : English
- Computer code
  - Programming language : ACSL version 10
  - Comment language : English
- Runtime : 10 - 30 secs for a one-year simulation on a PC-486

6. STATUS
- Final working version ? : yes Version no.: 4.8
  - SOP : no SOP no.: -
  - User's guide : no
  - Tech. ref. manual : yes
  - Application reports : yes
- Under development? : yes

7. AVAILABILITY
- Available outside RIVM? : yes, but only with support by RIVM
- User contract mandatory? : no
- Costs :

8. DOCUMENTATION

Janse, J.H., T. Aldenberg & P.R.G. Kramer, 1992. A mathematical model of the phosphorus cycle in Lake Loosdrecht and simulation of additional measures. Hydrobiologica 233: 119-136.
Aldenberg, T., J.H. Janse & P.R.G. Kramer, 1993. Fitting the dynamic model PCLAKE to a multi-lake survey through Bayesian statistics. LWD-notitie 93-4. Ecological Modelling, submitted.

1. NAME OF THE MODEL : **PESTLA**

2. CONTACT IN RIVM

Name	:	Ton M.A. van der Linden
Laboratory	:	LBG
Phone	:	030-743342 Fax: 030-292897

3. PURPOSE : Modelling the behaviour and transport of organic compounds (pesticides) in the unsaturated zone of the soil.

4. POLICY THEME : Dispersion

5. TECHNICAL SPECIFICATIONS

Processes	:	advection, diffusion, dispersion, plant-uptake, Freundlich sorption, (pseudo) first order transformation
Compartments	:	soil layers of variable size
Components/compounds	:	water, organic compound (pesticide)
Spatial resolution		
Discretization	:	fixed
Dimension	:	1D
Length scale	:	m
Application scale	:	local
Temporal resolution		
Timestep	:	fixed
Calculation timestep	:	0.02 day
Output timestep	:	variable (days)
Input data	:	bulk density, soil organic matter profile, soil moisture-soil suction relationship, soil moisture-conductivity relationship, organic matter sorption constant (Kom), Freundlich exponent, half-life time
Output data	:	water balance, compound balance, concentration profiles, residues in plough layer, maximum concentration in groundwater, amount reaching saturated zone, amount taken up by plants
User interface		
Operation	:	Batch
Communication language	:	English
Computer code		
Programming language	:	CSMP (and FORTRAN)
Comment language	:	English
Runtime	:	ca. 0.5 hours CPU per year real time on PC-386

6. STATUS

Final working version ?	:	yes Version no.: 1.0
SOP	:	yes SOP no.: LBG/821
User's guide	:	no
Tech. ref. manual	:	no
Application reports	:	yes
Under development?	:	yes

7. AVAILABILITY

Available outside RIVM?	:	yes, contact Winand Staring Centre, P.O.Box 125, Nl-6700 AC Wageningen
User contract mandatory?	:	-
Costs	:	-

8. DOCUMENTATION

A.M.A. van der Linden & J.J.T.I. Boesten, 1989. Berekening van de mate van uitspoeling en accumulatie van bestrijdingsmiddelen als functie van hun sorptiecoëfficiënt en omzettingssnelheid in bouwvoormateriaal. RIVM Report no. 728800003.

1. NAME OF THE MODEL : **POLCOL** (A model for Pollution Control in industrial situations)

2. CONTACT IN RIVM

Name	:	C.J. Peek
Laboratory	:	Laboratory for Waste Materials and Emissions
Phone	:	030-743623 Fax: 030-293651

3. PURPOSE : To increase the transparency of the relation between pollution, abatement and abatement costs in industrial situations.

4. POLICY THEME : -

5. TECHNICAL SPECIFICATIONS

Processes	:	the model is to be considered as calculation tool
Compartments	:	air, water, waste
Components/compounds	:	contaminents
Spatial resolution		
Discretization	:	-
Dimension	:	-
Length scale	:	-
Application scale	:	-
Temporal resolution		
Timestep	:	-
Calculation timestep	:	-
Output timestep	:	-
Input data	:	plant data: general, sources, flows, technologies
Output data	:	results of calculation: pollution abatement, costs
User interface		
Operation	:	Interactive
Communication language	:	English
Computer code		
Programming language	:	Turbo Pascal
Comment language	:	English
Runtime	:	-

6. STATUS

Final working version ?	:	yes Version no.: 1.0
SOP	:	no SOP no.: -
User's guide	:	yes
Tech. ref. manual	:	yes
Application reports	:	yes
Under development?	:	no

7. AVAILABILITY

Available outside RIVM?	:	yes
User contract mandatory?	:	yes
Costs	:	fl. 750,-

8. DOCUMENTATION

Slootweg, J. & J.P.M. Ros, 1989. POLCOL, A model for Pollution Control in industrial situations. RIVM Report no. 738715002.

Slootweg, J., J.P.M. Ros & P. van der Poel, 1990. Target group study pharmaceutical industry, part: supplementary report (appendices). RIVM Report no. 736301003.

1. NAME OF THE MODEL : **PROFCD** (PROFile Convection - Diffusion)

2. CONTACT IN RIVM

Name	:	E.J.M. Veling
Laboratory	:	CWM
Phone	:	030-742072 Fax: 030-250740 Email: cwmedve@rivm

3. PURPOSE : PROFCD is a program to produce graphical representation of concentration profiles versus time or distance from the entrance of a half-infinite column.

4. POLICY THEME : Acidification, desiccation, eutrophication

5. TECHNICAL SPECIFICATIONS

Processes	:	Analytical representation of the solution of the convection-diffusion equation with adsorption and decay and three different boundary conditions.
Compartments	:	A half-infinite homogeneous column, constant velocity and linear adsorption and decay.
Components/compounds	:	
Spatial resolution		
Discretization	:	continuous in time and distance
Dimension	:	1D
Length scale	:	not applicable
Application scale	:	local/regional
Temporal resolution		
Timestep	:	
Calculation timestep	:	
Output timestep	:	
Input data	:	Input: dispersion coefficient, velocity, retardation, decay, duration block pulse, either scaled or unscaled.
Output data	:	Scaled concentration profiles versus (un)scaled time or distance.
User interface		
Operation	:	Batch
Communication language	:	English
Computer code		
Programming language	:	FORTRAN 77
Comment language	:	English
Runtime	:	about 0.25 - 0.5 min. for a standard problem on a PC-386.

6. STATUS

Final working version ?	:	yes Version no.: 3.01 (25-11-'92)
SOP	:	no SOP no.: -
User's guide	:	yes
Tech. ref. manual	:	no
Application reports	:	no
Under development?	:	no

7. AVAILABILITY

Available outside RIVM?	:	yes
User contract mandatory?	:	yes
Costs	:	commercial price

8. DOCUMENTATION

Veling, E.J.M., 1993. ZEROCD and PROFCD, Description of Two Programs to Supply Quick Information with respect to the Penetration of Tracers into the Soil. RIVM Report no. 725206009.

1. NAME OF THE MODEL : **PROMISE** (PROgnosis Model of Inputs to Surface water and Emission reductions)

2. CONTACT IN RIVM

Name	:	Corine Quarles van Ufford
Laboratory	:	LAE
Phone	:	030-743573 Fax: 030-293651

3. PURPOSE : Module of RIM+ to calculate the current and future surface water load and the effects of technical measures and (autonomous) economic developments on the total emissions, the atmospheric deposition and the surface water load.

4. POLICY THEME : Dispersion, all

5. TECHNICAL SPECIFICATIONS

Processes	:	calculation tool: no specific mathematical operations
Compartments	:	air, water, (soil, waste)
Components/compounds	:	chemical compounds
Spatial resolution		
Discretization	:	variable: 5*5 km grid, X-Y coordinates, etc.
Dimension	:	2D
Length scale	:	km
Application scale	:	Netherlands/PAWN-districts and -junctions
Temporal resolution		
Timestep	:	1 year
Calculation timestep	:	1 year
Output timestep	:	1 year
Input data	:	vs RIM+/PROMO; Information about sewarage system, waste water treatment and discharge situation of processes, land use; technical measures to influence discharge situation, effectiveness of treatment plants and sewage system, costs of measures.
Output data	:	Emissions to air and water per target group, atmospheric deposition, surface water load per PAWN district and PAWN junction, amount of pollutant in influent and sewage sludge
User interface		
Operation	:	Interactive
Communication language	:	English
Computer code		
Programming language	:	Ingres Windows 4GL, C
Comment language	:	English
Runtime	:	several minutes

6. STATUS

Final working version ?	:	yes Version no.: 1.3
SOP	:	- SOP no.: -
User's guide	:	no
Tech. ref. manual	:	no
Application reports	:	no
Under development?	:	yes

7. AVAILABILITY

Available outside RIVM?	:	no, only at RIZA
User contract mandatory?	:	-
Costs	:	-

8. DOCUMENTATION

None

1. NAME OF THE MODEL : **RAF** (Rekenmodel AFvalverwijdering)

2. CONTACT IN RIVM

Name : D. Nagelhout / C.W.M. van der Maas
Laboratory : LAE
Phone : 030-743032 Fax: 030-293651 Email: laecwm@rivm.nl

3. PURPOSE : Scenario model for predicting the amount of solid waste in the Netherlands and the effect of measures and (autonomous) economic developments. The treatment of solid waste can be optimized on costs.

4. POLICY THEME : Solid waste

5. TECHNICAL SPECIFICATIONS

Processes : the model is to be considered as a calculation tool: no specific mathematical operations
Compartments : waste
Components/compounds : Solid waste, waste components
Spatial resolution
Discretization : fixed
Dimension : National, Counties, Region
Length scale : -
Application scale : national scale (the Netherlands) and smaller (up to combinations of towns)
Temporal resolution
Timestep : fixed
Calculation timestep : 1 year
Output timestep : 1 years
Input data : The amount of waste produced in the past, predictions for the (economical) development per sector, location and capacity of landfills, installations to incinerate waste etc.
Output data : The amount of waste in the future, the costs of waste disposal for alternative policies, energy from incineration of waste
User interface
Operation : Interactive
Communication language : Dutch
Computer code
Programming language : Turbo Pascal 6.0
Comment language : Dutch
Runtime : < 30 seconds on a 286 PC

6. STATUS

Final working version ? : yes Version no.: 1.0
SOP : no SOP no.: -
User's guide : yes
Tech. ref. manual : yes
Application reports : no
Under development? : no

7. AVAILABILITY

Available outside RIVM? : no
User contract mandatory? : -
Costs : -

8. DOCUMENTATION

Van der Maas, C.W.M., 1993. Gebruikershandleiding Rekenmodel Afvalverwijdering (RAF). Een computermodel voor het maken van afvalprognoses voor Nederland. RIVM Report no. 736001005.

1. NAME OF THE MODEL : **RAINS**

2. CONTACT IN RIVM

Name	:	J.-P. Hettelingh
Laboratory	:	MTV
Phone	:	030 - 743048

3. PURPOSE : European acidification simulation. Assessment of (optimized) abatement strategies (and costs) of SO_2, NO_x, NH_3, in Europe.

4. POLICY THEME : Acidification

5. TECHNICAL SPECIFICATIONS

Processes	:	Air, energy, fluegas, soil and water chemistry. Simulation of soil, surface water effects. Computation of concentration and deposition of acidic compounds. See also GEOMAN and CRITLO.
Compartments	:	air, soil, water
Components/compounds	:	SO_2, NO_x, NH_3
Spatial resolution		
Discretization	:	variable
Dimension	:	2D
Length scale	:	
Application scale	:	regional, continental
Temporal resolution		
Timestep	:	variable
Calculation timestep	:	1 or 5 years
Output timestep	:	optional
Input data	:	emissions, energy use, source-receptor relationship for SO_2, NO_x, NH_3, landuse (forests), soilchemistry, surface water chemistry,
Output data	:	Emission patterns, deposition and concentrations of S, N, acidity in soils and lakes
User interface		
Operation	:	Interactive
Communication language	:	English
Computer code		
Programming language	:	FORTRAN
Comment language	:	English
Runtime	:	seconds per user defined option

6. STATUS

Final working version ?	:	yes Version no.: -
SOP	:	no SOP no.: -
User's guide	:	yes
Tech. ref. manual	:	no
Application reports	:	yes
Under development?	:	yes

7. AVAILABILITY

Available outside RIVM?	:	yes, developed at IIASA, Laxenbourg, Austria
User contract mandatory?	:	-
Costs	:	-

8. DOCUMENTATION

Book, scientific publications, reports, papers.

1. NAME OF THE MODEL : **REM2** (Radiological Emergency Management system)

2. CONTACT IN RIVM

Name	:	P.A.M. Uijt de Haag
Laboratory	:	LSO
Phone	:	030-743713 Fax: 030-291604

3. PURPOSE : REM2 is a model to assess the consequences of an accidental release of radioactive materials to the air. The model calculates radiation doses and the effect of counter-measures.

4. POLICY THEME : nuclear emergency management (dispersion,disturbance)

5. TECHNICAL SPECIFICATIONS

Processes	:	dispersion and transport in air, deposition, external radiation, inhalation
Compartments	:	air, top soil
Components/compounds	:	radionuclides
Spatial resolution		
Discretization	:	variable
Dimension	:	2D
Length scale	:	km
Application scale	:	local
Temporal resolution		
Timestep	:	fixed
Calculation timestep	:	
Output timestep	:	quarters of an hour
Input data	:	source terms, meteo (e.g. wind velocity and direction, height of mixing layer, rain intensity), model parameters (e.g. intervention levels countermeasures)
Output data	:	contour maps of doses, doses in time at a location, histograms of the number of victims in time.
User interface		
Operation	:	Interactive
Communication language	:	Dutch
Computer code		
Programming language	:	FORTRAN
Comment language	:	unknown
Runtime	:	5-10 minutes for a dose calculation on a PC-386

6. STATUS

Final working version ?	:	yes Version no.: 2.12
SOP	:	yes SOP no.: LSO/P/061
User's guide	:	yes
Tech. ref. manual	:	yes
Application reports	:	no
Under development?	:	no

7. AVAILABILITY

Available outside RIVM?	:	model developed at TNO
User contract mandatory?	:	-
Costs	:	contact TNO

8. DOCUMENTATION

Van Renswoude G.J. & P.J.G. Verhaegh, 1990. Handboek bij het Radiological Emergency Management system, versie 2.12. TNO publicatie no. FEL-90-C202.
Wiesenhaan, J.H., 1990. Handleiding - Omgaan met REM2.

1. NAME OF THE MODEL : **RESAM** (REgional Soil Acidification Model)

2. CONTACT IN RIVM

Name : Aaldrik Tiktak
Laboratory : LBG
Phone : 030-743343 Fax: 030-292897

3. PURPOSE : Simulation of the effects of acidification on forest soils.

4. POLICY THEME : Acidification

5. TECHNICAL SPECIFICATIONS

Processes : convective solute transport, cation exchange, mineral weathering, nitrification, plant uptake, mineralization of organic matter
Compartments : soil - (forest floor) - (vegetation)
Components/compounds : H^+, Al^{3+}, Ca^{2+}, Mg^{2+}, K^+, Na^+, NH_4^+, NO_3^-, SO_4^-, Cl^-, HCO_3^-, $RCOO^-$

Spatial resolution
Discretization : variable
Dimension : 1D (but regionally applicable)
Length scale : m
Application scale : regional (for 65% of Dutch forest area)

Temporal resolution
Timestep : fixed
Calculation timestep : 5 days
Output timestep : 1 year

Input data : atmospheric deposition, initial concentrations in soil solution, exchanger and mineral phase, water balance, biochemical rate constants, Al equilibrium constant
Output data : fluxes and concentrations of solutes in soil, with emphasis to aluminum, protons and nitrogen

User interface
Operation : Batch
Communication language : English

Computer code
Programming language : FORTRAN 77
Comment language : English
Runtime : 24 hours (512 runs of 100 years on HP workstation)

6. STATUS

Final working version ? : yes Version no.: 24-12-1991
SOP : yes SOP no.: LBG/817
User's guide : yes
Tech. ref. manual : yes
Application reports : yes
Under development? : yes

7. AVAILABILITY

Available outside RIVM? : The model has been developed by the Winand Staring Centre, Wageningen, NL.
User contract mandatory? : -
Costs : -

8. DOCUMENTATION

Bakema *et al.*, 1990. Dutch Acidification Systems model - Specifications. Dutch Priority Programme on Acidification, Report no. 114.1.01. RIVM, Bilthoven.

1. NAME OF THE MODEL : **RIM⁺** (Environmental Information and planning model)

2. CONTACT IN RIVM

Name : W. Laan, P.H. Bruinsma
Laboratory : LAE
Phone : 030-743463/3024 Fax: 030-293651 Email: laewl@rivm.nl

3. PURPOSE : Calculation of emission-, waste- and energy-projections for several future years, based upon economic, demographic and other general scenarios. It is possible to choose policy abatement, so it's possible to examine the effects of measurements.

4. POLICY THEME : can be used for all themes.

5. TECHNICAL SPECIFICATIONS

Processes : the model is to be considered as a administration and calculation tool: no specific mathematical operations
Compartments : air, water, soil, waste
Components/compounds : all chemical compounds; all waste materials
Spatial resolution
Discretization : fixed
Dimension : 2D
Length scale : -
Application scale : regional
Temporal resolution
Timestep : flexible (min. 1 year)
Calculation timestep : min. 1 year
Output timestep : min. 1 year
Input data : activity levels for a list of economic sectors; economic scenarios for this sectors; emission/waste coefficients for different chemical compounds; possible measures to reduce emission or waste-production.
Output data : emission/waste production, per region, per sector, per chemical compound, for chosen years
User interface
Operation : Interactive
Communication language : English
Computer code
Programming language : Ingres Windows 4GL, C
Comment language : English
Runtime : depends on many factors (1 to 5 minutes)

6. STATUS

Final working version ? : Yes Version no.: 2.0
SOP : No SOP no.: -
User's guide : no (English on-line help available)
Tech. ref. manual : yes
Application reports : no
Under development? : yes

7. AVAILABILITY

Available outside RIVM? : yes
User contract mandatory? : yes
Costs : unknown

8. DOCUMENTATION

Laan, W.P.M., *et al.*, 1993. Scenariostudies voor afvalstoffen, emissies en energie - Een opzet voor het nieuwe Reken- en Informatiesysteem Milieuhygiëne (RIM⁺). RIVM Report no. 736001004.

1. NAME OF THE MODEL : **RISKA**

2. CONTACT IN RIVM

Name	:	H. Slaper
Laboratory	:	LSO
Phone	:	030-743488 Fax: 030-291604

3. PURPOSE : Calculation of location dependent mortality risks related to possible accidental releases from nuclear power plants in Europe

4. POLICY THEME : Riskmap for nuclear power plants

5. TECHNICAL SPECIFICATIONS

Processes	:	accidental releases; atmospheric dispersion and deposition, doses received
Compartments	:	air; soil (deposition) (input from NUCRED regarding conversion from contamination to doses)
Components/compounds	:	
Spatial resolution		
Discretization	:	variable
Dimension	:	2D
Length scale	:	variable; default approximately 50 x 50 km
Application scale	:	regional / continental
Temporal resolution		
Timestep	:	
Calculation timestep	:	
Output timestep	:	risk per year of operation
Input data	:	European nuclear power plants (locations, type, power, accident probabilities); release characteristics
Output data	:	risks on user defined grid in Europe
User interface		
Operation	:	Interactive
Communication language	:	English
Computer code		
Programming language	:	Turbo Pascal
Comment language	:	Dutch
Runtime	:	approx. 40 min. (for 8000 receptor locations)

6. STATUS

Final working version ?	:	yes Version no.: 5.21
SOP	:	yes SOP no.: LSO/P/012
User's guide	:	yes
Tech. ref. manual	:	yes
Application reports	:	yes
Under development?	:	yes

7. AVAILABILITY

Available outside RIVM?	:	no
User contract mandatory?	:	-
Costs	:	-

8. DOCUMENTATION

Slaper, H., R.O. Blaauboer & G.J. Eggink, 1993. A risk assessment for accidental releases from nuclear power plants in Europe. RIVM Report no. 743030002.

Slaper H., 1993. Europese risicokaart voor kerncentrales: het RISKA programma. Achtergronddocument opgenomen in logboek LSO/L/327.

1. NAME OF THE MODEL : **SimpleBox**

2. CONTACT IN RIVM
- **Name** : D. van de Meent
- **Laboratory** : ECO
- **Phone** : 030-743130/3015 Fax: 030-251925 Email: ecodm@rivm.nl

3. PURPOSE : Diagnostic method for analyzing the environmental fate of micropollutants in terms of key pathways and key processes. Time-dependent or steady-state concentration levels in environmental compartments are computed from steady or intermittent releases into air, water and soil. Designed for non-point pollution situations (existing and new chemicals).

4. POLICY THEME : Dispersion, risk assessment, global change, sustainable development

5. TECHNICAL SPECIFICATIONS
- **Processes** : emission; import; intermedia transport; degradation; export; soil leaching; sediment burial
- **Compartments** : air, water, suspended matter, biota, sediment, soil (3x)
- **Components/compounds** : micropollutants (metals, organics)
- **Spatial resolution**
  - **Discretization** : fixed
  - **Dimension** : 0 D (homogeneous environmental compartments)
  - **Length scale** : user defined (default The Netherlands)
  - **Application scale** : regional / continental / global
- **Temporal resolution**
  - **Timestep** : user defined
  - **Calculation timestep** : user defined
  - **Output timestep** : user defined
- **Input data** : constant or intermittant loadings (emission, import); rate constants for intermedia transport; intermedia equilibrium constants; degradation rate constants
- **Output data** : Steady-state concentrations or time series of concentrations for in air, water, suspended matter, biota, sediment and soil boxes; intermedia fluxes
- **User interface**
  - **Operation** : Interactive
  - **Communication language** : English
- **Computer code**
  - **Programming language** : Compiled Lotus 1-2-3 spreadsheet, FAME executable
  - **Comment language** : English
- **Runtime** : < 1 - 2 min on 486-PC

6. STATUS
- **Final working version ?** : yes Version no.: 1.0 (930801)
  - **SOP** : no SOP no.: -
  - **User's guide** : yes
  - **Tech. ref. manual** : yes
  - **Application reports** : yes
- **Under development?** : no

7. AVAILABILITY
- **Available outside RIVM?** : yes
- **User contract mandatory?** : no
- **Costs** : handling costs

8. DOCUMENTATION

Van de Meent, D., 1993. SIMPLEBOX, a generic multimedia fate evaluation model. RIVM Report no. 6672720001.

1. NAME OF THE MODEL : **SimpleTreat**

2. CONTACT IN RIVM
- **Name** : J. Struijs
- **Laboratory** : ECO
- **Phone** : 030 - 742001/3015

3. PURPOSE : Diagnostic method to predict the most probable fate of micro-pollutants continuously entering a sewage treatment plant. The model may be used to estimate concentrations in effluent and sludge if the emission scenario is known or to analyse the relative contributions of removal processes and factors controlling them.

4. POLICY THEME : -

5. TECHNICAL SPECIFICATIONS
- **Processes** : Advection, (de)sorption, degradation, volatilization.
- **Compartments** : 9
- **Components/compounds** : divers
- **Spatial resolution**
  - **Discretization** : variable
  - **Dimension** : 9 boxes
  - **Length scale** : user definable
  - **Application scale** : local
- **Temporal resolution**
  - **Timestep** : steady-state calculation
  - **Calculation timestep** : -
  - **Output timestep** : -
- **Input data** : Steady loading of the system (only if exposure concentrations are to be estimated), partition coefficients for interphase equilibria (air-water, solids-water) or basic physico-chemical properties of the chemicals (Kow, vapour pressure, solubility), biodegradation test result.
- **Output data** : Steady-state concentrations in the effluent, ambient air and exported sludge. Fate of the chemical as percentage removed by degradation, volatilization, exported sludge and exported water.
- **User interface**
  - **Operation** : Interactive
  - **Communication language** : English
- **Computer code**
  - **Programming language** : Lotus 1-2-3
  - **Comment language** : English
- **Runtime** : < 1 min

6. STATUS
- **Final working version ?** : yes Version no.: 2.1
  - **SOP** : no SOP no.: -
  - **User's guide** : no
  - **Tech. ref. manual** : yes
  - **Application reports** : yes
- **Under development?** : no

7. AVAILABILITY
- **Available outside RIVM?** : yes
- **User contract mandatory?** : no
- **Costs** : handling costs

8. DOCUMENTATION

Struijs, J. *et al.*, 1991. SimpleTreat: a spreadsheet based box model to predict the fate of xenobiotics in a municipal waste water treatment plant. RIVM Report no. 670208002.

1. NAME OF THE MODEL : SLAM

2. CONTACT IN RIVM

Name	:	Addo van Pul
Laboratory	:	LLO
Phone	:	030-742818 Fax: 030-287532 Email: addo@rivm.nl

3. PURPOSE : calculation of concentrations of primary emitted ammonia on a local scale

4. POLICY THEME : acidification

5. TECHNICAL SPECIFICATIONS

Processes	:	atmospheric transport, dispersion, chemical transformation, deposition
Compartments	:	surface layer of the atmopsheric boundary layer
Components/compounds	:	ammonia
Spatial resolution		
Discretization	:	variable
Dimension	:	3D
Length scale	:	from 100 m up to 10-15 km
Application scale	:	local scale
Temporal resolution		
Timestep	:	one hour (fixed)
Calculation timestep	:	variable, depending on gridsetting and number of sources
Output timestep	:	variable, one hour up to several days
Input data	:	actual meteorology, emissions, gridsetting, source heigth, roughness length
Output data	:	concentrations of ammonia for specified grid and/or specified receptor points
User interface		
Operation	:	interactive and/or batch
Communication language	:	Dutch
Computer code		
Programming language	:	FORTRAN
Comment language	:	Dutch
Runtime	:	variable, depending on gridsetting and number of sources

6. STATUS

Final working version ?	:	yes Version no.: 1.0
SOP	:	no SOP no.: -
User's guide	:	yes
Tech. ref. manual	:	no
Application reports	:	yes
Under development?	:	no

7. AVAILABILITY

Available outside RIVM?	:	no
User contract mandatory?	:	-
Costs	:	-

8. DOCUMENTATION

Boermans, G.M.F & W.A.J. van Pul, 1993. SLAM, een transportmodel voor de korte termijn en de korte afstand met als toepassing de beschrijving van de verspreiding van ammoniak. RIVM Report no. 722105003.
Boermans, G.M.F. & W.A.J. van Pul, 1992. SLAM, A short term and local scale ammonia transport model. In: H.R. Olesen & T. Mikkelse (eds), Objectives for a next generation of practical short range atmospheric dispersion models. DCAR, Roskilde, Denmark

1. NAME OF THE MODEL : **Sloot-box**

2. CONTACT IN RIVM

Name	:	Jan Linders
Laboratory	:	ACT
Phone	:	030-743164

3. PURPOSE : assessment of possible effects for water organisms in case of drift after the application of pesticides

4. POLICY THEME : dispersion

5. TECHNICAL SPECIFICATIONS

Processes	:	degradation, volatilization, advection, sedimentation, resuspension
Compartments	:	water (ditch) / fish-daphnids-algae
Components/compounds	:	pesticides
Spatial resolution		
Discretization	:	fixed
Dimension	:	1D
Length scale	:	m
Application scale	:	local
Temporal resolution		
Timestep	:	fixed
Calculation timestep	:	day
Output timestep	:	day
Input data	:	substance related parameters, laboratory test data, toxicity data, application data
Output data	:	risk assessment water organisms for short time and long time exposure
User interface		
Operation	:	Interactive
Communication language	:	both english version and dutch version available
Computer code		
Programming language	:	Lotus 1-2-3 macro language
Comment language	:	Dutch
Runtime	:	< 1 sec.

6. STATUS

Final working version ?	:	yes	Version no.: 1.0
SOP	:	no	SOP no.: -
User's guide	:	yes	
Tech. ref. manual	:	no	
Application reports	:	yes	
Under development?	:	no	

7. AVAILABILITY

Available outside RIVM?	:	yes
User contract mandatory?	:	no
Costs	:	free

8. DOCUMENTATION

Linders, J.B.H.J. *et al.*, 1990. Beoordeling van het gedrag van bestrijdingsmidellen in oppervlaktewater in relatie tot expositie van waterorganismen. RIVM Report no. 678611002.

1. NAME OF THE MODEL : **SOILNL** (SOIL Nitrogen NL-version)

2. CONTACT IN RIVM

Name	:	Kas G.B. Makaske, Hans J.M. van Grinsven
Laboratory	:	LBG
Phone	:	030-743314 Fax: 030-292897

3. PURPOSE : Simulation of accumulation and transport of nitrogen in agricultural soils

4. POLICY THEME : Eutrophication

5. TECHNICAL SPECIFICATIONS

Processes	:	addition of fertilizer and manure, nitrification, mineralization, convective transport, denitrification, plant uptake, harvest, grazing, volatilization, leaching
Compartments	:	soil layers, groundwater, plant, organic matter
Components/compounds	:	soil water, nitrate, ammonium, organic nitrogen, manure, fertilizer
Spatial resolution		
Discretization	:	variable
Dimension	:	1D
Length scale	:	cm
Application scale	:	local to regional
Temporal resolution		
Timestep	:	fixed
Calculation timestep	:	1 day
Output timestep	:	variable
Input data	:	soil hydraulic properties, decomposition rates of organic matter, nitrification rate, denitrification rate, crop nitrogen uptake, meteorological data, fertilizer & manure input, grazing intensity
Output data	:	soil water balance, soil nitrogen balance, nitrate concentrations in soil- and groundwater, leaching, nitrogen states and rates
User interface		
Operation	:	Batch
Communication language	:	English
Computer code		
Programming language	:	FORTRAN 77
Comment language	:	English
Runtime	:	2 min. for 1 year calculation on PC-386; 5 sec. on HP 720

6. STATUS

Final working version ?	:	no Version no.: 1.0
SOP	:	yes SOP no.: LBG/809
User's guide	:	yes
Tech. ref. manual	:	yes
Application reports	:	no
Under development?	:	yes

7. AVAILABILITY

Available outside RIVM?	:	yes
User contract mandatory?	:	-
Costs	:	-

8. DOCUMENTATION

Van Grinsven, J.J.M. & G.B. Makaske, 1993. A one-dimensional model for transport and accumulation of water and nitrogen, based on the Swedish model SOILN. RIVM Report no. 714908001.
Johnsson, H., L. Bergstrom, P.-E. Jansson & K. Paustian, 1987. Simulated nitrogen dynamics and losses in a layered agricultural soil. Agriculture, Ecosystems and Environment 18, 239-254.

1. NAME OF THE MODEL : **SOILVEG** (SOIL VEGetation)

2. CONTACT IN RIVM

Name	:	Kees van Heerden
Laboratory	:	LBG
Phone	:	030-743343 Fax: 030-292897

3. PURPOSE : Simulation of the effects of acidification on forests and forest soils.

4. POLICY THEME : Acidification

5. TECHNICAL SPECIFICATIONS

Processes	:	root uptake, tree growth, mineralization of organic matter, solute transport, mineral weathering, cation adsorption, nitrification,
Compartments	:	five plant compartments, litter layer, soil layers.
Components/compounds	:	*In air:* SO_2, NH_3, O_3.
		In plant: N, Ca, Mg, K, CH_2O.
		In soil: H, Al, Ca, Mg, K, Na, NH_4, NO_3, SO_4, Cl, RCOO
Spatial resolution		
Discretization	:	variable
Dimension	:	1D
Length scale	:	m
Application scale	:	local
Temporal resolution		
Timestep	:	variable
Calculation timestep	:	dynamic: 1 hour - 10 days
Output timestep	:	1 day, 1 year
Input data	:	atmospheric deposition, air pollutant concentrations, initial biomass, nutrient status in vegetation and soil
Output data	:	nutrient concentrations and fluxes in vegetation and soil. Biomasses. Growth reduction.
User interface		
Operation	:	Batch
Communication language	:	English
Computer code		
Programming language	:	ANSI-C
Comment language	:	English
Runtime	:	10 min. on HP 750 workstation

6. STATUS

Final working version ?	:	yes Version no.: 3.0
SOP	:	yes SOP no.: LBG/816
User's guide	:	yes
Tech. ref. manual	:	yes
Application reports	:	yes
Under development?	:	yes

7. AVAILABILITY

Available outside RIVM?	:	no
User contract mandatory?	:	-
Costs	:	-

8. DOCUMENTATION

Van Minnen, J.G., J.J.M. van Grinsven & C. van Heerden, 1991. SOILVEG: A model to evaluate effects of acid atmospheric deposition on soil and forest. Volume 3: Long-term regional effects of various deposition scenarios on Douglas fir. Dutch Priority Programme on Acidification Report no. 114.1-04. RIVM, Bilthoven.

1. NAME OF THE MODEL : **SOLWAT** (SOiL WATer model)

2. CONTACT IN RIVM

Name	:	Kas G.B.Makaske, Hans J.M. van Grinsven
Laboratory	:	LBG
Phone	:	030-743314 Fax: 030-292897

3. PURPOSE : Simulation of transport of water and heat in soil. Parametric water balance model

4. POLICY THEME : eutrophication, acidification, dispersion

5. TECHNICAL SPECIFICATIONS

Processes	:	interception, soil evaporation, transpiration, percolation, root water uptake, groundwater discharge, heat transport
Compartments	:	soil layers
Components/compounds	:	soil water, groundwater, heat
Spatial resolution		
Discretization	:	fixed
Dimension	:	1D
Length scale	:	cm
Application scale	:	local - regional
Temporal resolution		
Timestep	:	fixed
Calculation timestep	:	1 day
Output timestep	:	variable
Input data	:	daily precipitation, open water evaporation, air temperature, soil hydraulic properties, drainage function
Output data	:	annual soil water and heat balance, time series of daily soil water contents, temperature, and water and heat fluxes
User interface		
Operation	:	Batch
Communication language	:	English
Computer code		
Programming language	:	FORTRAN 77
Comment language	:	English
Runtime	:	2 min. for a 1 year calculation on PC-386, 5 sec. on HP 720

6. STATUS

Final working version ?	:	no Version no.: 1.0
SOP	:	yes SOP no.: LBG/819
User's guide	:	yes
Tech. ref. manual	:	yes
Application reports	:	no
Under development?	:	yes

7. AVAILABILITY

Available outside RIVM?	:	no
User contract mandatory?	:	-
Costs	:	-

8. DOCUMENTATION

Van Grinsven, J.J.M. & G.B. Makaske, 1993. A one-dimensional model for transport of water and nitrogen, based on the Swedish model SOILN. RIVM Report no. 714908001.

1. NAME OF THE MODEL : **SRM**

2. CONTACT IN RIVM

Name	:	Hans van Jaarsveld
Laboratory	:	LLO
Phone	:	030-742818 Fax: 030-287531

3. PURPOSE : a meta-model based on the results of the TREND model; the model is used primarily for a quick calculation of acid deposition for a large number of emission scenarios

4. POLICY THEME : acidification, dispersion, eutrophication

5. TECHNICAL SPECIFICATIONS

Processes	:	none, however, in the original TREND model all relevant atmospheric processes are included
Compartments	:	atmospheric boundary layer
Components/compounds	:	SO_2, SO_4, NO_x, NO_3, NH_3, NH_4
Spatial resolution		
Discretization	:	fixed: predefined set of receptor and source areas
Dimension	:	2D
Length scale	:	
Application scale	:	regional
Temporal resolution		
Timestep	:	fixed
Calculation timestep	:	
Output timestep	:	10 year averaged
Input data	:	emissions for 13 economical sectors in each of 20 source areas in The Netherlands, high and low level emissions in 19 foreign source areas (rest of Europe).
Output data	:	yearly averaged deposition fluxes of SO_x, NO_y and NH_x (estimated for long-term averaged meteorological conditions)
User interface		
Operation	:	Interactive / Batch
Communication language	:	
Computer code		
Programming language	:	
Comment language	:	
Runtime	:	

6. STATUS

Final working version ?	:	yes	Version no.: 2.0
SOP	:	no	SOP no.: -
User's guide	:	yes	
Tech. ref. manual	:	no	
Application reports	:	yes	
Under development?	:	no	

7. AVAILABILITY

Available outside RIVM?	:	yes
User contract mandatory?	:	no
Costs	:	handling costs

8. DOCUMENTATION

Olsthoorn, T.O. & F.A.A.M. de Leeuw, 1988. Berekening van de zure depositie op Nederland op basis van overdrachtsmatrices. RIVM Report no. 758805005.
De Leeuw, F.A.A.M. & J.A. van Jaarsveld, 1992. Bepaling van bron-receptor relaties voor verzurende componenten. RIVM Report no. 723001009

1. NAME OF THE MODEL : **SRMSEA**

2. CONTACT IN RIVM

Name	:	Hans van Jaarsveld
Laboratory	:	LLO
Phone	:	030-742818 Fax: 030-287531

3. PURPOSE : A meta-model based on the results of the TREND model; the model is used primarily for a quick calculation of nitrogen and cadmium deposition to the North Sea for a large number of emission scenarios

4. POLICY THEME : acidification, dispersion, eutrophication

5. TECHNICAL SPECIFICATIONS

Processes	:	none, however, in the original TREND model all relevant atmospheric processes are included
Compartments	:	atmospheric boundary layer
Components/compounds	:	NO_x, NH_x, Cd
Spatial resolution		
Discretization	:	fixed: predefined set of receptor points and source areas
Dimension	:	2D
Length scale	:	
Application scale	:	regional
Temporal resolution		
Timestep	:	fixed
Calculation timestep	:	n.a.
Output timestep	:	10 year averaged
Input data	:	emissions (3 source height levels) for each of 20 source areas in The Netherlands; emissions (2 souce height levels) in 19 foreign source areas (rest of Europe).
Output data	:	yearly averaged transfer coefficients of NO_x, and Cd (estimated for long-term averaged meteorological conditions)
User interface		
Operation	:	-
Communication language	:	-
Computer code		
Programming language	:	-
Comment language	:	-
Runtime	:	-

6. STATUS

Final working version ?	:	yes Version no.: 1.0
SOP	:	no SOP no.: -
User's guide	:	yes
Tech. ref. manual	:	no
Application reports	:	yes
Under development?	:	no

7. AVAILABILITY

Available outside RIVM?	:	yes
User contract mandatory?	:	no
Costs	:	handling costs

8. DOCUMENTATION

Van Jaarsveld, J.A. & F.A.A.M. de Leeuw, 1993. Source receptor relations for the calculation of atmospheric deposition to the North Sea: Nitrogen and Cadmium. RIVM Report no. 222402002.

1. NAME OF THE MODEL : STEM

2. CONTACT IN RIVM
- Name : Wout Slob
- Laboratory : CWM
- Phone : 030-743242

3. PURPOSE : Estimation of the statistical distribution of exposure to chemicals via food, in relation to various factors including age and body weight.

4. POLICY THEME : Risk management

5. TECHNICAL SPECIFICATIONS
- Processes :
- Compartments :
- Components/compounds :
- Spatial resolution
  - Discretization :
  - Dimension :
  - Length scale :
  - Application scale : human population
- Temporal resolution
  - Timestep :
  - Calculation timestep :
  - Output timestep :
- Input data : concentrations in food
- Output data : exposure (median and percentiles) as function of age
- User interface
  - Operation : Interactive / Batch
  - Communication language : Graphical User Interface, English
- Computer code
  - Programming language : C, Splus
  - Comment language : English
- Runtime :

6. STATUS
- Final working version ? : no Version no.: 1.0
  - SOP : no SOP no.: -
  - User's guide : no
  - Tech. ref. manual : no
  - Application reports : yes
- Under development? : yes

7. AVAILABILITY
- Available outside RIVM? : no
- User contract mandatory? : -
- Costs : -

8. DOCUMENTATION

Slob, W., 1993. Modelling human exposure to chemicals in food. RIVM Report no. 639102002.
Slob, W., 1993. Modeling long-term exposure of the whole population to chemicals in food. Risk Analysis 13, 525-530

1. NAME OF THE MODEL : **STOLWIJK MODEL**

2. CONTACT IN RIVM

Name	:	P.M. van Egmond
Laboratory	:	MTV
Phone	:	030-743816

3. PURPOSE : Economic shrink calculation of livestock

4. POLICY THEME : Acidification, eutrophication

5. TECHNICAL SPECIFICATIONS

Processes	:	Costs of environmental measures related to manure and ammonia; Economic shrink related to costs
Compartments	:	-
Components/compounds	:	-
Spatial resolution		
Discretization	:	-
Dimension	:	-
Length scale	:	
Application scale	:	regional
Temporal resolution		
Timestep	:	-
Calculation timestep	:	-
Output timestep	:	-
Input data	:	Production of manure and ammonia emissions; Livestock; (costs and effects of) environmental measures; Economic yield
Output data	:	Economic shrink
User interface		
Operation	:	Interactive
Communication language	:	-
Computer code		
Programming language	:	Lotus 1-2-3
Comment language	:	-
Runtime	:	minutes

6. STATUS

Final working version ?	:	yes	Version no.: -
SOP	:	no	SOP no.: -
User's guide	:	no	
Tech. ref. manual	:	no	
Application reports	:	yes	
Under development?	:	yes	

7. AVAILABILITY

Available outside RIVM?	:	yes, developed at CPB
User contract mandatory?	:	-
Costs	:	-

8. DOCUMENTATION

Stolwijk, H.J.J., 1989. Economische gevolgen voor de veehouderij van een drietal milieuscenario's. CPB, Den Haag. Onderzoeks-memorandum 57.

1. NAME OF THE MODEL : **STRAVERA** (Strategy for Effective Reduction of Surface water load)

2. CONTACT IN RIVM

Name	:	Corine Quarles van Ufford
Laboratory	:	LAE
Phone	:	030-743573 Fax: 030-293651

3. PURPOSE : Scenario model for quick calculations of the effect of technical measures and (autonomous) economic developments on the total emissions, the atmospheric deposition and the surface water load.

4. POLICY THEME : Dispersion

5. TECHNICAL SPECIFICATIONS

Processes	:	calculation tool: no specific mathematical operations
Compartments	:	air, water, (soil, waste)
Components/compounds	:	chemical compounds
Spatial resolution		
Discretization	:	fixed
Dimension	:	-
Length scale	:	-
Application scale	:	used only on the national scale (the Netherlands) but other scales are also possible
Temporal resolution		
Timestep	:	fixed
Calculation timestep	:	1 year
Output timestep	:	5 years
Input data	:	processes which "produce" emission, activity level of processes, emission- and deposition-coëfficients, discharge situation of waste water and atmospheric deposition, possible measurements
Output data	:	Emissions to air and water per target group, atmospheric deposition, surface water load via different routes, amount of pollutant in influent and sewage sludge
User interface		
Operation	:	Interactive
Communication language	:	Dutch
Computer code		
Programming language	:	Turbo Pascal
Comment language	:	Dutch
Runtime	:	< 30 seconds on a 286 PC

6. STATUS

Final working version ?	:	yes Version no.: -
SOP	:	no SOP no.: -
User's guide	:	yes
Tech. ref. manual	:	no
Application reports	:	yes
Under development?	:	yes

7. AVAILABILITY

Available outside RIVM?	:	no
User contract mandatory?	:	-
Costs	:	-

8. DOCUMENTATION

Quarles van Ufford, C.H.A. & J.P.M. Ros, 1991. STRAVERA, a model for the calculation of emission trends and surface water load. RIVM Report no. 736301011.(English translation: RIVM Report no. 736301012)

1. NAME OF THE MODEL : **SWIF** (Soil Water In Forested ecosystems)

2. CONTACT IN RIVM

Name	:	Aaldrik Tiktak
Laboratory	:	LBG
Phone	:	030-743343. Fax: 030-292897

3. PURPOSE : Simulation of transient, unsaturated, vertical soil water transport and interception.

4. POLICY THEME : acidification, dessication, dispersion

5. TECHNICAL SPECIFICATIONS

Processes	:	vertical soil water transport and root water uptake in the unsaturated soil zone (Darcian flow)
Compartments	:	unsaturated soil zone, forest floor, forest canopy
Components/compounds	:	water in the unsaturated soil zone and forest floor
Spatial resolution		
Discretization	:	variable
Dimension	:	1D
Length scale	:	m
Application scale	:	local
Temporal resolution		
Timestep	:	variable
Calculation timestep	:	0.001 - 1 day
Output timestep	:	1 day
Input data	:	soil physical characteristics, root length distribution, rainfall & evapotranspiration, vegetation properties
Output data	:	water content, soil water fluxes, root water uptake, transpiration, soil evaporation, interception
User interface		
Operation	:	Batch
Communication language	:	English
Computer code		
Programming language	:	FORTRAN 77 (ANSI)
Comment language	:	English
Runtime	:	1 minute CPU on HP workstation for 4 year simulation

6. STATUS

Final working version ?	:	yes Version no.: 2.3
SOP	:	yes SOP no.: LBG/818
User's guide	:	yes
Tech. ref. manual	:	yes
Application reports	:	yes
Under development?	:	yes

7. AVAILABILITY

Available outside RIVM?	:	yes, model has been developed by the Laboratory for Physical Geography & Soil Science, Amsterdam, NL
User contract mandatory?	:	-
Costs	:	-

8. DOCUMENTATION

Tiktak, A., W. Bouten & M.P. Schaap, 1990. SWIF: A simulation model of Soil Water In Forested ecosystems. Univ. van Amsterdam, FGBL(???), UVA, report nr. 44, Amsterdam.

1. NAME OF THE MODEL : **TAM3** (Terra Aqua Model)

2. CONTACT IN RIVM

Name : R.O. Blaauboer
Laboratory : LSO
Phone : 030-742645 Fax: 030-291604 Email: lsorob@krypton.rivm.nl

3. PURPOSE : Compartmental model for the calculation of the time-integrated concentrations of a radionuclide in lakewater, fish, crop and sediment; furthermore TAM3 is an example-program to show uncertainty and sensitivity analyses.

4. POLICY THEME : Dispersion

5. TECHNICAL SPECIFICATIONS

Processes : time-integrated dispersion of radioactivity in lakewater, fish, crop and sediment
Compartments : lakewater, fish, crop, sediment
Components/compounds : radioactive material
Spatial resolution
Discretization : fixed
Dimension : 0D
Length scale : not applicable
Application scale : local
Temporal resolution
Timestep : fixed
Calculation timestep : time-integrated
Output timestep : time-integrated
Input data : Several transferparameter values like sedimentation rate, uptake by fish, crop; mass of water, sediment and fish etc.
Output data : Time-integrated concentrations of considered radionuclide in water, sediment, fish and crop as well as uncertainty and/or sensitivity analyses
User interface
Operation : Interactive / Batch both possible
Communication language : English
Computer code
Programming language : Borland Turbo Pascal 3.0
Comment language : English
Runtime : Depending on number of iterations: sec.-min. on a PC-386

6. STATUS

Final working version ? : yes Version no.: 3
SOP : no SOP no.: -
User's guide : yes
Tech. ref. manual : yes
Application reports : no
Under development? : no

7. AVAILABILITY

Available outside RIVM? : yes, available from Oak Ridge Nat. Lab. (TN), USA
User contract mandatory? : no
Costs : contact R.H. Gardner (ORNL)

8. DOCUMENTATION

Gardner, R.H., 1988. TAM3: A program demonstrating Monte Carlo sensitivity and uncertainty analysis. BIOMOVS Technical Report No.2. NIRP, Stockholm.

1. NAME OF THE MODEL : TARGETS

2. CONTACT IN RIVM

Name	:	J. Rotmans
Laboratory	:	CWM
Phone	:	030-743320

3. PURPOSE : To operationalise, and to render applicable, the concepts of global change and sustainable development.

4. POLICY THEME : global change, sustainable development

5. TECHNICAL SPECIFICATIONS

Processes	:	social, demographic and economic processes, biophysical and ecological processes, land use and land capacity changes associated processes, hydrological processes, chemical pollution transport processes
Compartments	:	global environmental system: land (agricultural land, ecosystems, human affected area), hydrosphere (oceans, rivers, lakes, coastal waters), geosphere (soil, soil water), and atmosphere. global human system: population, economy, energy, minerals.
Components/compounds	:	steering model, pressure models, biosphere models and impact models.
Spatial resolution		
Discretization	:	variable
Dimension	:	0D
Length scale	:	
Application scale	:	regional - continental
Temporal resolution		
Timestep	:	fixed
Calculation timestep	:	1 year
Output timestep	:	1 year
Input data	:	economic and technological data, policy measures, environmental data.
Output data	:	health, environmental, socio-economic, ecological indicators
User interface		
Operation	:	Interactive
Communication language	:	English
Computer code		
Programming language	:	M, visualisation computer language
Comment language	:	English
Runtime	:	10 sec.

6. STATUS

Final working version ?	:	no	Version no.: 0.5
SOP	:	no	SOP no.: -
User's guide	:	no	
Tech. ref. manual	:	no	
Application reports	:	no	
Under development?	:	yes	

7. AVAILABILITY

Available outside RIVM?	:	yes
User contract mandatory?	:	-
Costs	:	-

8. DOCUMENTATION

None

1. NAME OF THE MODEL : **TRAX** (TRAcks of X-rays)

2. CONTACT IN RIVM

Name : R.O. Blaauboer
Laboratory : LSO
Phone : 030-742645 Fax: 030-291604 Email: lsorob@krypton.rivm.nl

3. PURPOSE : Biophysical model to calculate energy deposition spectra and relative effectiveness of different kinds of ionizing radiation in biological material.

4. POLICY THEME : Dose-effect relationships

5. TECHNICAL SPECIFICATIONS

Processes : Calculation of electron slowing-down spectra and radiation specific effectiveness
Compartments : DNA-strings
Components/compounds : α, β, γ, X, n radiation
Spatial resolution
Discretization : variable
Dimension : 0D
Length scale : nanometer resolution
Application scale : cellulair
Temporal resolution
Timestep : -
Calculation timestep : -
Output timestep : -
Input data : Targettype, -thickness, radiationtype set, Cut-off energy for δ-rays, targetradius, effect probability, fitparameters (if needed)
Output data : Slowing-down spectra, stopping-power, average radius of track and average energy of particle, relative effectiveness parameters and/or fitted experimental data.
User interface
Operation : Interactive & Batch
Communication language : English
Computer code
Programming language : Borland Turbo Pascal 6.0
Comment language : English
Runtime : Depending on desired results: sec.-min. on PC-386

6. STATUS

Final working version ? : no Version no.: 7.2
SOP : no SOP no.: -
User's guide : no
Tech. ref. manual : yes
Application reports : yes
Under development? : yes

7. AVAILABILITY

Available outside RIVM? : no
User contract mandatory? : -
Costs : -

8. DOCUMENTATION

Blaauboer, R.O., in prep. Technical Manual of the biophysical model TRAX. RIVM Report.
Pruppers, M.J.M, H.P. Leenhouts & K.H. Chadwick, 1990. A track structure model for the spatial energy deposition of ionisering radiation. Rad. Prot. Dos. 31, 185-188.

1. NAME OF THE MODEL : **TREND**

2. CONTACT IN RIVM

Name	:	Hans van Jaarsveld
Laboratory	:	LLO
Phone	:	030-742818 Fax: 030-287531

3. PURPOSE : calculation of (long term) atmospheric concentration and deposition of primary emitted and secundary produced acidifying components; general purpose model

4. POLICY THEME : dispersion, acidification

5. TECHNICAL SPECIFICATIONS

Processes	:	atmospheric transport, dispersion, dry and wet deposition and chemical transformation
Compartments	:	atmospheric boundary layer (2 levels up to ca. 3 km)
Components/compounds	:	SO_2, SO_4, NO_x, NO_3, NH_3, NH_4, aerosols
Spatial resolution		
Discretization	:	variable
Dimension	:	3D
Length scale	:	variable from 100 m up to 1000 km
Application scale	:	variable from local to continental scale
Temporal resolution		
Timestep	:	variable: from one specific month to a 15-year averaged
Calculation timestep	:	
Output timestep	:	variable: from one specific month to a 15-year averaged
Input data	:	meteorological statistics; emissions: within the area of interest emissions must be given with a resolution corresponding with the required resolution of the deposition/concentration maps; at larger distances to the receptor area less spatial ressolution is needed.
Output data	:	concentrationand deposition fields
User interface		
Operation	:	Interactive / Batch
Communication language	:	English
Computer code		
Programming language	:	FORTRAN
Comment language	:	mixture of dutch and english
Runtime	:	highly dependent on number of sources and receptors

6. STATUS

Final working version ?	:	yes Version no.: 1.11
SOP	:	no SOP no.: -
User's guide	:	no
Tech. ref. manual	:	no
Application reports	:	yes
Under development?	:	yes

7. AVAILABILITY

Available outside RIVM?	:	no, however one version operational in Denmark
User contract mandatory?	:	-
Costs	:	-

8. DOCUMENTATION

Van Jaarsveld, J.A. & Onderdelinden, D., 1993. TREND; An analytical long-term deposition model for multi-scale applications (in prep.)

Van Jaarsveld, J.A., 1991. A quantitative model analysis of year to year changes in concentration and deposition. In: H. van Dop & D.G. Steyn (eds), Air pollution modelling and its application, Vol. VIII, 91-102. Plenum Press, New York.

1. NAME OF THE MODEL : UNCSAM

2. CONTACT IN RIVM
- Name : Peter Janssen / Peter Heuberger
- Laboratory : CWM
- Phone : 030-742760 / 743754

3. PURPOSE : Uncertainty and/or sensitivity analysis of simulation models; Monte Carlo sampling

4. POLICY THEME : All

5. TECHNICAL SPECIFICATIONS
- Processes :
- Compartments :
- Components/compounds :
- Spatial resolution
  - Discretization :
  - Dimension :
  - Length scale :
  - Application scale :
- Temporal resolution
  - Timestep :
  - Calculation timestep :
  - Output timestep :
- Input data : distribution specifications (input parameters)
- Output data : tables, plots, statistical information
- User interface
  - Operation : interactive, batch
  - Communication language : English
- Computer code
  - Programming language : FORTRAN 77, encapsulated in a C-shell
  - Comment language : English
- Runtime : problem dependent

6. STATUS
- Final working version ? : yes Version no.: 1.1
  - SOP : no SOP no.: -
  - User's guide : yes
  - Tech. ref. manual : yes
  - Application reports : yes
- Under development? : no

7. AVAILABILITY
- Available outside RIVM? : yes
- User contract mandatory? : yes
- Costs : $3000 (Universities $1500)

8. DOCUMENTATION

Janssen, P.H.M., W. Slob & J. Rotmans, 1990. Gevoeligheidsanalyse en onzekerheidsanalyse; een Inventarisatie van Ideeën, Methoden en Technieken. RIVM Report no. 958805001.
Janssen, P.H.M., P.S.C. Heuberger & R.Sanders, 1992. UNCSAM 1.1, a software package for sensitivity and uncertainty analysis. Manual. RIVM Report no. 959101004.

1. NAME OF THE MODEL : **USES** (Uniform System for the Evaluation of Substances)

2. CONTACT IN RIVM
- **Name** : D.T. Jager
- **Laboratory** : ECO
- **Phone** : 030 - 743783

3. PURPOSE : Risk/hazard assessment and priority setting for chemical substances. Endpoints are human beings, aquatic and terrestrial ecosystems, fish and worm eating predators, micro-organisms in a sewage treatment plant and specific non-target organisms for pesticides.

4. POLICY THEME : Risk management

5. TECHNICAL SPECIFICATIONS
- **Processes** : Sorption to sludge/sediment/soil, bio-degradation, volatilization, dilution, bioconcentration / bio-accumulation, leaching, transport through air, deposition, drinking water purification, waste water treatment a.o.
- **Compartments** : Air, surface water, soil (3 types), groundwater, drinking water, plants, cattle (meat+milk).
- **Components/compounds** : New and existing chemicals and agricultural pesticides.
- **Spatial resolution**
  - **Discretization** : none
  - **Dimension** : 1D
  - **Length scale** : local: 100-1000m from source
  - **Application scale** : local (not site-specific) / regional / continental
- **Temporal resolution**
  - **Timestep** : steady-state
  - **Calculation timestep** : -
  - **Output timestep** : -
- **Input data** : Substance data, toxicity data
- **Output data** : Hazard quotients (+ probability distribution for aquatic ecosystems) for the specified endpoints.
- **User interface**
  - **Operation** : Interactive
  - **Communication language** : English
- **Computer code**
  - **Programming language** : C++
  - **Comment language** : English
- **Runtime** : <1 min. per substance on a PC-386

6. STATUS
- **Final working version ?** : no Version no.: prototype II
  - **SOP** : no SOP no.: -
  - **User's guide** : yes
  - **Tech. ref. manual** : yes
  - **Application reports** : yes
- **Under development?** : yes

7. AVAILABILITY
- **Available outside RIVM?** : not yet
- **User contract mandatory?** : -
- **Costs** : -

8. DOCUMENTATION

VROM, WVC, RIVM, RPC, 1992. Uniform Beoordelingssysteem Stoffen (UBS) Tweede Prototype.

1. NAME OF THE MODEL : **UV-chain**

2. CONTACT IN RIVM

Name : H. Slaper
Laboratory : LSO
Phone : 030-743488 Fax: 030-291604

3. PURPOSE : Source-effect model for effects of ozone depletion. Prognostic evaluation of skin cancer incidence for various policy scenario's regarding the emission of ozone depleting substances.

4. POLICY THEME : Risk analysis UV, climate change

5. TECHNICAL SPECIFICATIONS

Processes : cfc production, and emission, atmospheric concentrations, chlorine levels; ozone depletion; UV-transfer through atmosphere; exposure effect model for skin cancer
Compartments : atmosphere
Components/compounds : 7 submodules; production, emission, tropospheric concentration, chlorine concentration, ozone depletion; UV-exposure and exposure-effect module
Spatial resolution
Discretization : fixed
Dimension : OD with elements of (2D) models
Application scale : regional / global latitude
Temporal resolution
Calculation timestep : 1 year
Output timestep : 1 year
Input data : production scenario's; age distribution population
Output data : chlorine concentration; ozone depletion; skin cancer incidence
User interface
Operation : Batch
Communication language : English
Computer code
Programming language : FORTRAN
Comment language : English
Runtime : 5 min.

6. STATUS

Final working version ? : yes Version no.: 1.0
SOP : no SOP no.: -
User's guide : yes
Tech. ref. manual : partly
Application reports : yes
Under development? : yes

7. AVAILABILITY

Available outside RIVM? : no
User contract mandatory? : -
Costs : -

8. DOCUMENTATION

Slaper H., M.G.J. den Elzen, H.J. van der Woerd & J. de Greef, 1992. Ozone depletion and skin cancer incidence: an integrated modelling approach. RIVM Report no. 749202001.

1. NAME OF THE MODEL : UVPROF

2. CONTACT IN RIVM
- Name : Hans van der Woerd
- Laboratory : LLO
- Phone : 030-742081 Fax: 030-287531

3. PURPOSE : calculation of UV-radiation and photolysis rates at various altitudes

4. POLICY THEME : global change, dispersion

5. TECHNICAL SPECIFICATIONS
- Processes : radiation transfer: scattering and absorption by air molecules, aerosols and various trace gases
- Compartments : atmosphere up to ca. 60 km
- Components/compounds : UV/vis radiation
- Spatial resolution
  - Discretization : fixed, vertical layer of 0.5-2 km
  - Dimension : 1D
  - Length scale : km
  - Application scale : any specified latitude
- Temporal resolution
  - Timestep : -
  - Calculation timestep : -
  - Output timestep : -
- Input data : ozone column, aerosol density, latitude, julian date
- Output data : UV-radiation, photolysis rates
- User interface
  - Operation : Interactive & Batch
  - Communication language : English
- Computer code
  - Programming language : FORTRAN
  - Comment language : English
- Runtime : small (< 1 min CPU on HP-9000)

6. STATUS
- Final working version ? : yes Version no.: -
  - SOP : no SOP no.: -
  - User's guide : no
  - Tech. ref. manual : no
  - Application reports : yes
- Under development? : no

7. AVAILABILITY
- Available outside RIVM? : yes
- User contract mandatory? : no
- Costs : handling costs

8. DOCUMENTATION

De Leeuw, F.A.A.M., 1989. Modelmatige berekening van fotolyse snelheden relevant voor tropospferische chemie. RIVM Report no. 228603003.
De Leeuw, F.A.A.M. & H. Slaper, 1990. UV straling in Nederland: indicatie van de invloed van een verandering in ozonkolom. RIVM Report no. 228903001.

1. NAME OF THE MODEL : WAPRO

2. CONTACT IN RIVM
- Name : F.J. Kragt
- Laboratory : LWD
- Phone : 030-743014 Fax: 030-262055

3. PURPOSE : Calculation of the future water demand of certain sectors by applying economic, demographic and technological scenario's. Exploring the effects of given measures to reduce water consumption.

4. POLICY THEME : Drinking water production, desiccation

5. TECHNICAL SPECIFICATIONS
- Processes : -
- Compartments : -
- Components/compounds : water
- Spatial resolution
  - Discretization : fixed
  - Dimension : 1D
  - Length scale : -
  - Application scale : regional
- Temporal resolution
  - Timestep : fixed
  - Calculation timestep : 10 years
  - Output timestep : 10 years
- Input data : activity levels for a list of economic sectors; economic scenarios for this sectors; possible measures to reduce water demand.
- Output data : water demand for a list of sectors; per region, per sector, per watertype, for years 2000, 2010, 2020
- User interface
  - Operation : Interactive
  - Communication language : Dutch
- Computer code
  - Programming language : Turbo Pascal v5.5
  - Comment language : Dutch
- Runtime : 1 minute to calculate one scenario for 3 years

6. STATUS
- Final working version ? : yes Version no.: -
  - SOP : no SOP no.: -
  - User's guide : yes
  - Tech. ref. manual : yes
  - Application reports : no
- Under development? : no

7. AVAILABILITY
- Available outside RIVM? : yes
- User contract mandatory? : no
- Costs : handling costs

8. DOCUMENTATION

Laan, W.P.M., 1990. Gebruikersdocumentatie WAPRO. Een model voor het maken van waterverbruiksprognoses. RIVM Report no. 738906003.

1. NAME OF THE MODEL : WATNAT

2. CONTACT IN RIVM
- Name : A.C.M. de Nijs
- Laboratory : LWD
- Phone : 030 - 743812 Fax: 030 - 252066

3. PURPOSE : Calculation of the water quality in the Dutch network of waterways and lakes (PAWN network)

4. POLICY THEME : dispersion, eutrophication

5. TECHNICAL SPECIFICATIONS
- Processes : transport; sorption; algal growth; sedimentation; resuspension; burial; diffusion; (de)nitrification; oxygen exchange; mineralization
- Compartments : water, sediment, algae
- Components/compounds : nutrients, N, P, Si
- Spatial resolution
  - Discretization : fixed
  - Dimension : 2D
  - Length scale : meter
  - Application scale : national
- Temporal resolution
  - Timestep : variable
  - Calculation timestep : variable
  - Output timestep : variable
- Input data : initial concentrations, discharges, boundary concentrations, wind speed, emissions
- Output data : variable
- User interface
  - Operation : Interactive & Batch
  - Communication language : English
- Computer code
  - Programming language : ACSL
  - Comment language : English
- Runtime : 1 hr per simulated year on a 486 PC

6. STATUS
- Final working version ? : yes Version no.: 1.00
  - SOP : yes SOP no.: -
  - User's guide : no
  - Tech. ref. manual : yes
  - Application reports : no
- Under development? : yes

7. AVAILABILITY
- Available outside RIVM? : no
- User contract mandatory? : -
- Costs : -

8. DOCUMENTATION

Wortelboer, F.G., A.C.M. de Nijs, J.H. Janse, P.R.G. Kramer & T. Aldenberg, 1993. WATNAT Version 2.06 Technical Documentation. RIVM LWD-notitie no. 93-12.
De Nijs, A.C.M., J.H. Janse, F.G. Wortelboer, P.R.G Kramer & T. Aldenberg, 1993. WATNAT Version 1.00 Model Documentation. RIVM LWD-notitie no. 93-13.

1. NAME OF THE MODEL : **ZEROCD** (ZERO Convection - Diffusion)

2. CONTACT IN RIVM

Name : E.J.M. Veling
Laboratory : CWM
Phone : 030-742072 Fax: 030-250740 Email: cwmedve@rivm

3. PURPOSE : ZEROCD calculates time instances when concentration levels reach specified values in a one-dimensional column.

4. POLICY THEME : Acidification, desiccation, eutrophication

5. TECHNICAL SPECIFICATIONS

Processes : Analytical representation of the solution of the convection-diffusion equation with adsorption and decay and three different boundary conditions. Internally is a root-finder procedure active.
Compartments : A half-infinite homogeneous column, constant velocity and linear adsorption and decay.
Components/compounds :
Spatial resolution
Discretization : continuous in time and distance
Dimension : 1D
Length scale :
Application scale : local/regional
Temporal resolution
Timestep :
Calculation timestep :
Output timestep :
Input data : Input: dispersion coefficient, velocity, retardation, decay, duration block pulse, either scaled or unscaled.
Output data : Time instances when concentration levels reach specified values.
User interface
Operation : Batch
Communication language : English
Computer code
Programming language : FORTRAN 77
Comment language : English
Runtime : About 0.25 - 0.5 min. for a standard problem on a PC-386.

6. STATUS

Final working version ? : yes Version no.: 3.01 (25-11-'92)
SOP : no SOP no.: -
User's guide : yes
Tech. ref. manual : no
Application reports : no
Under development? : no

7. AVAILABILITY

Available outside RIVM? : yes
User contract mandatory? : yes
Costs : commercial price

8. DOCUMENTATION

Veling, E.J.M., 1993. ZEROCD and PROFCD, Description of Two Programs to Supply Quick Information with respect to the Penetration of Tracers into the Soil. RIVM Report no. 725206009.

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