```
FSPD=2                                          128.2, C
    PPR    - PERCEIVED FOOD RATIO (DIMENSIONLESS)
    SMOOTH - FIRST-ORDER EXPONENTIAL INFORMATION DELAY
    FR     - FOOD RATIO (DIMENSIONLESS)
    FSPD   - FOOD SHORTAGE PERCEPTION DELAY (YEARS)


    NONRENEWABLE RESOURCE SECTOR

NR.K=NR.J+(DT)(-NRUR.JK)                         129, L
NR=NRI                                           129.1, N
NRI=1E12                                         129.2, C
    NR     - NONRENEWABLE RESOURCES (RESOURCE UNITS)
    DT     - TIME INTERVAL BETWEEN CONSECUTIVE
             CALCULATIONS (YEARS)
    NRUR   - NONRENEWABLE RESOURCE USAGE RATE (RESOURCE
             UNITS/YEAR)
    NRI    - NONRENEWABLE RESOURCES INITIAL (RESOURCE
             UNITS)

NRUR.KL=(POP.K)(PCRUM.K)(NRUF.K)                 130, R
    NRUR   - NONRENEWABLE RESOURCE USAGE RATE (RESOURCE
             UNITS/YEAR)
    POP    - POPULATION (PERSONS)
    PCRUM  - PER CAPITA RESOURCE USAGE MULTIPLIER
             (RESOURCE UNITS/PERSON-YEAR)
    NRUF   - NONRENEWABLE RESOURCE USAGE FACTOR
             (DIMENSIONLESS)

NRUF.K=CLIP(NRUF2,NRUF1,TIME.K,PYEAR)            131, A
NRUF1=1                                          131.1, C
NRUF2=1                                          131.2, C
    NRUF   - NONRENEWABLE RESOURCE USAGE FACTOR
             (DIMENSIONLESS)
    CLIP   - A FUNCTION SWITCHED DURING THE RUN
    NRUF2  - NRUF, VALUE AFTER TIME=PYEAR
    NRUF1  - NRUF, VALUE BEFORE TIME=PYEAR
             (DIMENSIONLESS)
    TIME   - CURRENT TIME IN THE SIMULATION RUN
    PYEAR  - YEAR NEW POLICY IS IMPLEMENTED (YEAR)

PCRUM.K=TABHL(PCRUMT,IOPC.K,0,1600,200)          132, A
PCRUMT=0/.85/2.6/4.4/5.4/6.2/6.8/7/7             132.1, T
    PCRUM  - PER CAPITA RESOURCE USAGE MULTIPLIER
             (RESOURCE UNITS/PERSON-YEAR)
    TABHL  - A FUNCTION WITH VALUES SPECIFIED BY A TABLE
    PCRUMT - PCRUM TABLE
    IOPC   - INDUSTRIAL OUTPUT PER CAPITA (DOLLARS/
             PERSON-YEAR)

NRFR.K=NR.K/NRI                                  133, A
    NRFR   - NONRENEWABLE RESOURCE FRACTION REMAINING
             (DIMENSIONLESS)
    NR     - NONRENEWABLE RESOURCES (RESOURCE UNITS)
    NRI    - NONRENEWABLE RESOURCES INITIAL (RESOURCE
             UNITS)

FCAOR.K=CLIP(FCAOR2.K,FCAOR1.K,TIME.K,PYEAR)     134, A
    FCAOR  - FRACTION OF CAPITAL ALLOCATED TO OBTAINING
             RESOURCES (DIMENSIONLESS)
    CLIP   - A FUNCTION SWITCHED DURING THE RUN
    FCAOR2 - FCAOR, VALUE AFTER TIME=PYEAR
             (DIMENSIONLESS)
    FCAOR1 - FCAOR, VALUE BEFORE TIME=PYEAR
             (DIMENSIONLESS)
    TIME   - CURRENT TIME IN THE SIMULATION RUN
    PYEAR  - YEAR NEW POLICY IS IMPLEMENTED (YEAR)

FCAOR1.K=TABHL(FCAOR1T,NRFR.K,0,1,.1)            135, A
FCAOR1T=1/.9/.7/.5/.2/.1/.05/.05/.05/.05         135.1, T
    FCAOR1 - FCAOR, VALUE BEFORE TIME=PYEAR
             (DIMENSIONLESS)
    TABHL  - A FUNCTION WITH VALUES SPECIFIED BY A TABLE
    FCAOR1T- FCAOR1 TABLE
    NRFR   - NONRENEWABLE RESOURCE FRACTION REMAINING
             (DIMENSIONLESS)

FCAOR2.K=TABHL(FCAOR2T,NRFR.K,0,1,.1)            136, A
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```
FCAOR2T=1/.9/.7/.5/.2/.1/.05/.05/.05/.05         136.1, T
    FCAOR2 - FCAOR, VALUE AFTER TIME=PYEAR
             (DIMENSIONLESS)
    TABHL  - A FUNCTION WITH VALUES SPECIFIED BY A TABLE
    FCAOR2T- FCAOR2 TABLE
    NRFR   - NONRENEWABLE RESOURCE FRACTION REMAINING
             (DIMENSIONLESS)

    PERSISTENT POLLUTION SECTOR

PPGR.KL=(PPGIO.K+PPGAO.K)*(PPGF.K)               137, R
    PPGR   - PERSISTENT POLLUTION GENERATION RATE
             (POLLUTION UNITS/YEAR)
    PPGIO  - PERSISTENT POLLUTION GENERATED BY
             INDUSTRIAL OUTPUT (POLLUTION UNITS/YEAR)
    PPGAO  - PERSISTENT POLLUTION GENERATED BY
             AGRICULTURAL OUTPUT (POLLUTIONUNITS/YEAR)
    PPGF   - PERSISTENT POLLUTION GENERATION FACTOR
             (DIMENSIONLESS)

PPGF.K=CLIP(PPGF2,PPGF1,TIME.K,PYEAR)            138, A
PPGF1=1                                          138.1, C
PPGF2=1                                          138.2, C
    PPGF   - PERSISTENT POLLUTION GENERATION FACTOR
             (DIMENSIONLESS)
    CLIP   - A FUNCTION SWITCHED DURING THE RUN
    PPGF2  - PPGF, VALUE AFTER TIME=PYEAR
             (DIMENSIONLESS)
    PPGF1  - PPGF, VALUE BEFORE TIME=PYEAR
             (DIMENSIONLESS)
    TIME   - CURRENT TIME IN THE SIMULATION RUN
    PYEAR  - YEAR NEW POLICY IS IMPLEMENTED (YEAR)

PPGIO.K=PCRUM.K*POP.K*FRPM*IMEF*IMTI             139, A
FRPM=.02                                         139.1, C
IMEF=.1                                          139.2, C
IMTI=10                                          139.3, C
    PPGIO  - PERSISTENT POLLUTION GENERATED BY
             INDUSTRIAL OUTPUT (POLLUTION UNITS/YEAR)
    PCRUM  - PER CAPITA RESOURCE USAGE MULTIPLIER
             (RESOURCE UNITS/PERSON-YEAR)
    POP    - POPULATION (PERSONS)
    FRPM   - FRACTION OF RESOURCES AS PERSISTENT
             MATERIALS (DIMENSIONLESS)
    IMEF   - INDUSTRIAL MATERIALS EMISSION FACTOR
             (DIMENSIONLESS)
    IMTI   - INDUSTRIAL MATERIALS TOXICITY INDEX
             (POLLUTION UNITS/RESOURCE UNIT)

PPGAO.K=AIPH.K*AL.K*FIPM*AMTI                    140, A
FIPM=.001                                        140.1, C
AMTI=1                                           140.2, C
    PPGAO  - PERSISTENT POLLUTION GENERATED BY
             AGRICULTURAL OUTPUT (POLLUTIONUNITS/YEAR)
    AIPH   - AGRICULTURAL INPUTS PER HECTARE (DOLLARS/
             HECTARE-YEAR)
    AL     - ARABLE LAND (HECTARES)
    FIPM   - FRACTION OF INPUTS AS PERSISTENT MATERIALS
             (DIMENSIONLESS)
    AMTI   - AGRICULTURAL MATERIALS TOXICITY INDEX
             (POLLUTION UNITS/DOLLAR)

PPAPR.KL=DELAY3(PPGR.JK,PPTD)                    141, R
PPTD=20                                          141.1, C
    PPAPR  - PERSISTENT POLLUTION APPEARANCE RATE
             (POLLUTION UNITS/YEAR)
    DELAY3 - THIRD-ORDER EXPONENTIAL MATERIAL DELAY
    PPGR   - PERSISTENT POLLUTION GENERATION RATE
             (POLLUTION UNITS/YEAR)
    PPTD   - PERSISTENT POLLUTION TRANSMISSION DELAY
             (YEARS)

PPOL.K=PPOL.J+(DT)(PPAPR.JK-PPASR.JK)            142, L
PPOL=2.5E7                                       142.1, N
    PPOL   - PERSISTENT POLLUTION (POLLUTION UNITS)
    DT     - TIME INTERVAL BETWEEN CONSECUTIVE
             CALCULATIONS (YEARS)
```