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$$$CONTINUOUS SYSTEM MODELING PROGRAM  III   V1M0   TRANSLATOR OUTPUT$$$

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*
TITLE CSMP-III SIMULATION OF WORLD DYNAMICS-2
TITLE T. OTSUMI AND Y. SHINDOU
TITLE MITSUBISHI RESEARCH INSTITUTE
TITLE 1-6-1, OHTEMACHI, CHIYODAKU, TOKYO, 100. PHONE (03)-214-5531
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* 1.  INTRODUCTION
*--------------------------------------------------------------------------------
*                                                                          6060
*     THIS WORLD DYNAMICS MODEL WAS FIRST CONSTRUCTED BY J. FORRESTER
*     OF MASSACHUSETTS INSTITUTE OF TECHNOLOGY.
*     THOUGH THE ORIGINAL MODEL WAS WRITTEN IN DYNAMO LANGUAGE,
*     THE MODEL, WHEN IT WAS OBTAINED FROM J.MCLEOD OF SIMULATION COUNCILS,INC.,
*     WAS CONVERTED TO BASIC LANGUAGE.
*     THEN, THIS MODEL IN BASIC LANUAGE WAS ONCE AGAIN
*     CONVERTED INTO CSMP-III LANUAGE BY YUJI SHINDOU IN JULY, 1972.
*                                                                         10100
*     (REFERENCE - FORRESTER, JAY W.,"WORLD DYNAMICS"  )
*     (            WRIGHT-ALLEN PRESS,INC.             )
*     (            238 MAIN STREET                     )
*     (            CAMBRIDGE, MASSACHUSETTS, 02142     )
*
*********************************************************************************
*********************************************************************************
INITIAL SEGMENT                                                           1600
*********************************************************************************
*********************************************************************************
*                                                                         1950
*--------------------------------------------------------------------------------
* 2.  INITIAL CONDITION OF MODEL
*--------------------------------------------------------------------------------
*                                                                         7250
INCON CII    =   C.4CCCE+C9, CIAFI =   C.2CCCE+00,...
      NRI    = 900.0000E+09, PI    =   1.6500E+09,...
      PCLI   =   C.2C00E+09
*                                                                         2950
*     ---------------------------------------------------------------
*                                                                         9200
*     CII    = CAPITAL INVESTMENT,  INITIAL (CAPITAL UNITS)              3900
*     CIAFI = CAPITAL-INVESTMENT-IN-AGRICULTURE FRACTION,  INITIAL       2500
*                (DIMENSIONLESS)                                          2600
*     NRI    = NATURAL RESOURCE,  INITIAL (NATURAL RESOURCE UNITS)       7800
*     PI     = POPULATION,  INITIAL (PEOPLE)                             8800
*     POLI   = POLLUTION,  INITIAL (POLLUTION UNITS)                     9600
*                                                                        23900
*********************************************************************************
*********************************************************************************
DYNAMIC SEGMENT                                                           4400
*********************************************************************************
*********************************************************************************
*                                                                         4700
RENAME   TIME = T                                                         1800
*

*     ---------------------------------------------------------------
*                                                                         5500
*     T      = CALENDAR TIME (YEARS)                                    11800
*
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*-----------------------------------------------------------------------------
* 3.  POPULATION (P)
*-----------------------------------------------------------------------------
* 3.1 POPULATION (P)
*-----------------------------------------------------------------------------
*                                                                        8250
*     (SECTION 3.1 OF REFERENCE)
*                                                                        7050
*     POPULATION P IS A SYSTEM "LEVEL" VARIABLE.  A SYSTEM LEVEL RE-      100
*     PRESENTS THE PROCESS OF ACCUMULATION.  LEVELS PROVIDE THE SYSTEM    200
*     "MEMORY" OR CONTINUITY THAT CARRIES THE PAST INTO THE FUTURE.       300
*
*     POPULATION AT ANY TIME IS CALCULATED AS THE POPULATION AT THE       400
*     PRECEDING POINT IN TIME, PLUS THE PEOPLE WHO HAVE BEEN ADDED BY     500
*     THE BIRTH RATE (BR) IN THE INTERVENING INTERVAL, MINUS THE PEOPLE
*     REMOVED BY THE DEATH RATE (DR).
*                                                                        5810
*     ---------------------------------------------------------------
*                                                                       14500
      P     = INTGRL(PI,BR-DR)                                         5850
*                                                                       10300
*     ---------------------------------------------------------------
*                                                                       10300
*     P     = POPULATION (PEOPLE)                                      8600
*     BR    = BIRTH RATE (PEOPLE/YEAR)
*     DR    = DEATH RATE (PEOPLE/YEAR)
*                                                                        7700
*-----------------------------------------------------------------------------
* 3.2 BIRTH RATE (BR)
*-----------------------------------------------------------------------------
*
*     (SECTION 3.2, 3.3, 3.16, 3.17, 3.18 OF REFERENCE)
*                                                                       10100
*     BASIC BIRTH RATE DEPENDS ON POPULATION (P) AND ON A COEFFICIENT (BRN).
*     BUT THE ACTUAL BIRTH RATE WILL DEPEND ON THE CONDITIONS OF CAPITAL
*     INVESTMENT (CI) AND NATURAL RESOURCES (NR) AS THEY MANIFEST THEMSELVES
*     IN MATERIAL STANDARD OF LIVING (MSL), ON CROWDING, ON FOOD AVAILABILITY,
*     AND ON POLLUTION.
*
*     ---------------------------------------------------------------
*
      BR    = P*BRN1*BRFM*BRMM*BRCM*BRPM
      BRCM  = AFGEN( BRCMT,   CRX)                                      1300
      BRFM  = AFGEN( BRFMT,   FRX)                                      1100
      BRMM  = AFGEN( BRMMT,   MSLX)                                     1200
      BRN1  = FCNSW(SWT1-T,BRN1,BRN1,BRN)
      BRPM  = AFGEN( BRPMT, POLRX)                                      1400
*                                                                       12200
*     ---------------------------------------------------------------
*
PARAMETER  BRN   =   C.04CCE+00, BRN1  =   C.04CCE+CC,...               1900
           SWT1  = 197.00CCE+01
*
FUNCTION  BRCMT = (  0.0 ,  1.05), (  1.0 ,  1.0 ), (  2.0 ,  0.9 ),...
                  (  3.0 ,  0.7 ), (  4.0 ,  0.6 ), (  5.0 ,  0.55)

FUNCTION  BRFMT = (  C.C ,  C.0 ), (  1.0 ,  1.0 ), (  2.0 ,  1.6 ),...
                  (  3.0 ,  1.9 ), (  4.0 ,  2.0 )
FUNCTION  BRMMT = (  0.0 ,  1.2 ), (  1.C ,  1.0 ), (  2.0 ,  0.85),...
                  (  3.0 ,  C.75), (  4.0 ,  0.7 ), (  5.0 ,  0.7 )
FUNCTION  BRPMT = (  0.0 ,  1.02), ( 10.0 ,  C.9 ), ( 20.0 ,  C.7 ),...
                  ( 30.0 ,  0.4 ), ( 40.0 ,  0.25), ( 50.0 ,  0.15),...
                  ( 6C.0 ,  0.1 )
*                                                                        9650
*     ---------------------------------------------------------------
*                                                                       10250
*     BR    = BIRTH RATE (PEOPLE/YEAR)                                  1000
*     BRCM  = BIRTH-RATE-FROM-CROWDING MULTIPLIER (DIMENSIONLESS)       1100
*     BRCMT = BIRTH-RATE-FROM-CROWDING-MULTIPLIER TABLE                 1200
*     BRFM  = BIRTH-RATE-FROM-FOOD MULTIPLIER (DIMENSIONLESS)           1300
*     BRFMT = BIRTH-RATE-FROM-FOOD-MULTIPLIER TABLE                     1400
*     BRMM  = BIRTH-RATE-FROM-MATERIAL MULTIPLIER (DIMENSIONLESS)       1500
*     BRMMT = BIRTH-RATE-FROM-MATERIAL-MULTIPLIER TABLE                 1600
*     BRN   = BIRTH RATE NORMAL (FRACTION/YEAR)                         1700
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*     BRN1  = BIRTH RATE NORMAL NO. 1 (FRACTION/YEAR)                          1800
*     BRNT1 = BRN1, IF(SWT1.LT.T)
*           = BRN1, IF(SWT1.EQ.T)
*           = BRN , IF(SWT1.GT.T)
*     BRPM  = BIRTH-RATE-FROM-POLLUTION MULTIPLIER (DIMENSIONLESS)             1900
*     BRPMT = BIRTH-RATE-FROM-POLLUTION-MULTIPLIER TABLE                       2000
*     SWT1  = SWITCH TIME NO. 1 FOR BRN (YEARS)                               11100
*                                                                              9550
*-------------------------------------------------------------------------------
* 3.3 DEATH RATE (DR)
*-------------------------------------------------------------------------------
*                                                                             10200
*     (SECTION 3.10, 3.11, 3.12, 3.13, 3.14 OF REFERENCE)
*                                                                              9850
*     BASIC DEATH RATE IS POPULATION (P) MULTIPLIED BY THE DEATH RATE NORMAL
*     (DRN), BUT THE ACTUAL DEATH RATE, LIKE THE BIRTH RATE, DEPENDS ON
*     CONDITIONS IN OTHER PARTS OF THE WORLD SYSTEM, THAT IS FOOD, CROWDING,
*     MATERIAL STANDARD OF LIVING, AND POLLUTION.
*
*     ---------------------------------------------------------------
*
      DR    = P*DRNT3*DRMM*DRPM*DRFM*DRCM
      DRCM  = AFGEN( DRCMT,   CRX)                                            2400
      DRFM  = AFGEN( DRFMT,   FRXX)                                           2300
      DRMM  = AFGEN( DRMMT,   MSLX)                                           2100
      DRNT3 = FCNSW(SWT3-T,DRN1,DRN1,DRN)
      DRPM  = AFGEN( DRPMT, PCLRX)                                            2200
*
*     ---------------------------------------------------------------
*
PARAMETER  DRN  =   0.028E+00, DRN1  =   0.028E+00,...                        2500
           SWT3 = 197.00E+01
*                                                                             10150
FUNCTION  DRCMT = (  0.0 ,  0.9 ), (  1.0 ,  1.0 ), (  2.0 ,  1.2 ),...
                  (  3.0 ,  1.5 ), (  4.0 ,  1.9 ), (  5.0 ,  3.0 )
FUNCTION  DRFMT = (  0.0 , 30.0 ), (  0.25,  3.0 ), (  0.5 ,  2.0 ),...
                  (  0.75,  1.4 ), (  1.0 ,  1.0 ), (  1.25,  0.7 ),...
                  (  1.5 ,  0.6 ), (  1.75,  0.5 ), (  2.0 ,  0.5 )
FUNCTION  DRMMT = (  0.0 ,  3.0 ), (  0.5 ,  1.8 ), (  1.0 ,  1.0 ),...
                  (  1.5 ,  0.8 ), (  2.0 ,  0.7 ), (  2.5 ,  0.6 ),...
                  (  3.0 ,  0.53), (  3.5 ,  0.5 ), (  4.0 ,  0.5 ),...

                  (  4.5 ,  0.5 ), (  5.0 ,  0.5 )
FUNCTION  DRPMT = (  0.0 ,  0.92), ( 10.0 ,  1.3 ), ( 20.0 ,  2.0 ),...
                  ( 30.0 ,  3.2 ), ( 40.0 ,  4.8 ), ( 50.0 ,  6.8 ),...
                  ( 60.0 ,  9.2 )
*                                                                              8100
*     ---------------------------------------------------------------
*
*     DR    = DEATH RATE (PEOPLE/YEAR)                                        4800
*     DRCM  = DEATH-RATE-FROM-CROWDING MULTIPLIER (DIMENSIONLESS)             4900
*     DRCMT = DEATH-RATE-FROM-CROWDING-MULTIPLIER TABLE                       5000
*     DRFM  = DEATH-RATE-FROM-FOOD MULTIPLIER (DIMENSIONLESS)                 5100
*     DRFMT = DEATH-RATE-FROM-FOOD-MULTIPLIER TABLE                           5200
*     DRMM  = DEATH-RATE-FROM-MATERIAL MULTIPLIER (DIMENSIONLESS)             5300
*     DRMMT = DEATH-RATE-FROM-MATERIAL-MULTIPLIER TABLE                       5400
*     DRN   = DEATH RATE NORMAL (FRACTION/YEAR)                               5500
*     DRN1  = DEATH RATE NORMAL NO. 1 (FRACTION/YEAR)                         5600
*     DRNT3 = DRN1, IF(SWT3.LT.T)
*           = DRN1, IF(SWT3.EQ.T)
*           = DRN , IF(SWT3.GT.T)
*     DRPM  = DEATH-RATE-FROM-POLLUTION MULTIPLIER (DIMENSIONLESS)            5700
*     DRPMT = DEATH-RATE-FROM-POLLUTION-MULTIPLIER TABLE                      5800
*     SWT3  = SWITCH TIME NO. 3 FOR DRN (YEARS)                              11300
*                                                                             6700
*-------------------------------------------------------------------------------
* 3.4 CROWDING RATIO (CR)
*-------------------------------------------------------------------------------
*                                                                            20300
*     (SECTION 3.15 OF REFERENCE)
*                                                                            20350
*     THE CROWDING RATIO RELATES THE POPULATION TO THE AVAILABLE LAND AREA.
*     IT IS COMPUTED BY DIVIDING THE POPULATION (P) BY THE LAND AREA (LA) AND BY
*     THE 1970 POPULATION DENSITY NORMAL (PDN)
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*     ------------------------------------------------------------------
*
      CR    = P/(LA*PDN)                                                  3600
      CRX   = LIMIT( 0.0, 5.0,    CR)                                     200
*
*     ------------------------------------------------------------------
*                                                                         10250
PARAMETER  LA    = 135.0000E+06, PDN   =  26.5000E+00
*
*     ------------------------------------------------------------------
*
*     CR    = CROWDING RATIO (DIMENSIONLESS)                              4700
*     CRX   = LIMITED VALUE OF "CR" (DIMENTIONLESS)
*           = 0.0, IF(CR.LT.0.0)
*           = 5.0, IF(CR.GT.5.0)
*           = CR, IF(CR.GE.0.0.AND.CR.LE.5.0)
*     LA    = LAND AREA (SQUARE KILOMETERS)                               7200
*     PDN   = POPULATION DENSITY NORMAL (PEOPLE/SQUARE KILOMETER)         8700
*                                                                         14650
*-----------------------------------------------------------------------------
* 4.  NATURAL RESOURCES (NR)
*-----------------------------------------------------------------------------
*                                                                         10550
*     (SECTION 3.6, 3.7, 3.8, 3.9, 3.42 OF REFERENCE)
*                                                                         20200
*     NATURAL RESOURCES (NR) ARE A SYSTEM LEVEL VARIABLE. THE ONLY RATE

*     OF FLOW IS THE OUTGOING USAGE RATE.  NATURAL RESOURCES (NR) IS
*     INTEGRATED WITH NEGATIVE VALUE OF NATURAL-RESOURCES-USAGE RATE(NRUR).
*     COMPUTED AT EACH TIME STEP BY SUBTRACTING THE USAGE RATE NRUR         100
*     MULTIPLIED BY THE TIME INTERVAL BETWEEN COMPUTATIONS.                 200
*
*     ------------------------------------------------------------------
*                                                                         20500
      NR    = INTGRL(NRI, -NRUR)                                          6400
      NREM  = AFGEN( NREMT, NRFRX)                                        6800
      NRFR  = NR/NRI                                                      6600
      NRFRX = LIMIT( 0.0, 1.0,  NRFR)                                      850
      NRMM  = AFGEN( NRMMT, MSLXX)                                        6700
      NRUR  = P*NRUNT2*NRMM
      NRUNT2= FCNSW(SWT2-T,NRUN1,NRUN1,NRUN)
*
*     ------------------------------------------------------------------
*                                                                         4000
PARAMETER  NRUN  =   1.0000E+00, NRUN1 =   1.0000E+00,...                 6900
           SWT2  = 197.0000E+01                                           6950
*                                                                         10250
FUNCTION  NREMT = (  0.0 ,  0.0 ), (  0.25,  0.15), (  0.5 ,  0.5 ),...
                  (  0.75,  0.85), (  1.0 ,  1.0 )
FUNCTION  NRMMT = (  0.0 ,  0.0 ), (  1.0 ,  1.0 ), (  2.0 ,  1.8 ),...
                  (  3.0 ,  2.4 ), (  4.0 ,  2.9 ), (  5.0 ,  3.3 ),...
                  (  6.0 ,  3.6 ), (  7.0 ,  3.8 ), (  8.0 ,  3.9 ),...
                  (  9.0 ,  3.95), ( 10.0 ,  4.0 )
*                                                                         10650
*     ------------------------------------------------------------------
*
*     NR    = NATURAL RESOURCES (NATURAL RESOURCE UNITS)                  7400
*     NREM  = NATURAL-RESOURCE-EXTRACTION MULTIPLIER (DIMENSIONLESS)      7500
*     NREMT = NATURAL-RESOURCE-EXTRACTION-MULTIPLIER TABLE                7600
*     NRFR  = NATURAL-RESOURCE FRACTION REMAINING (DIMENSIONLESS)         7700
*     NRFRX = LIMITED VALUE OF "NRFR" (DIMENTIONLESS)
*           = 0.0, IF(NRFR.LT.0.0)
*           = 1.0, IF(NRFR.GT.1.0)
*           = NRFR, IF(NRFR.GE.0.0.AND.NRFR.LE.1.0)
*     NRMM  = NATURAL-RESOURCE-FROM-MATERIAL MULTIPLIER (DIMENSIONLESS)   7900
*     NRMMT = NATURAL-RESOURCE-FROM-MATERIAL-MULTIPLIER TABLE             8000
*     NRUN  = NATURAL-RESOURCE USAGE NORMAL                               8100
*                 (NATURAL RESOURCE UNITS/PERSON/YEAR)                    8200
*     NRUN1 = NATURAL-RESOURCE USAGE NORMAL NO. 1                         8300
*                 (NATURAL RESOURCE UNITS/PERSON/YEAR)                    8400
*     NRUNT2= NRUN1B IF(SWT2.LT.T)
*           = NRUN1, IF(SWY2.EQ.T)
*           = NRUN , IF(SWT2.GT.T)
*     NRUR  = NATURAL-RESOURCE-USAGE RATE (NATURAL RESOURCE UNITS/YEAR)   8500
*     SWT2  = SWITCH TIME NO. 2 FOR NRUN (YEARS)                          11200
*
```

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*-----------------------------------------------------------------------
* 5.  CAPITAL INVESTMENT (CI)
*-----------------------------------------------------------------------
* 5.1 CAPITAL INVESTMENT (CI)
*-----------------------------------------------------------------------
*                                                                      6600
*     (SECTION 3.22, 3.23, 3.24, 3.25, 3.26, 3.27 OF REFERENCE)
*                                                                     14600
*     CAPITAL INVESTMENT (CI) IS ONE OF THE SYSTEM LEVELS. IT IS CREATED
*     BY ACCUMULATING THE CAPITAL INFLOW FROM CAPITAL-INVESTMENT        500
*     GENERATION (CIG) LESS THE OUTFLOW TO CAPITAL-INVESTMENT DISCARD (CID).
*                                                                      7150
*     ----------------------------------------------------------------
*
      CI    = INTGRL(CII,CIG-CID)                                      5100
      CIG   = P*CIGNT4*CIM
      CIGNT4= FCNSW(SWT4-T,CIGN1,CIGN1,CIGN)
      CID   = CIDNT5*CI
      CIDNT5= FCNSW(SWT5-T,CIDN1,CIDN1,CIDN)
      CIM   = AFGEN( CIMT, MSLX)                                       5700
      CIR   = CI/P                                                     5300
      CIRA  = CIR*CIAF/CIAFN                                           5200
      CIRAX = LIMIT( 0.0, 6.0,  CIRA)                                   650
      CIRX  = LIMIT( 0.0, 5.0,   CIR)                                   950
*
*     ----------------------------------------------------------------
*                                                                     19500
PARAMETER  CIDN  =   0.0250E+00, CIDN1 =   0.0250E+00,...             6100
           CIGN  =   0.0500E+00, CIGN1 =   0.0500E+00,...             6000
           SWT4  = 197.0000E+01, SWT5  = 197.0000E+01                 6300
*                                                                     1150
FUNCTION  CIMT  = (  0.0 ,  0.1 ), (  1.0 ,  1.0 ), (  2.0 ,  1.8 ),....
                  (  3.0 ,  2.4 ), (  4.0 ,  2.8 ), (  5.0 ,  3.0 )
*                                                                     8450
*     ----------------------------------------------------------------
*                                                                     6150
*     CI    = CAPITAL INVESTMENT (CAPITAL UNITS)                      2300
*     CID   = CAPITAL-INVESTMENT DISCARD (CAPITAL UNITS/YEAR)         3100
*     CIDN  = CAPITAL-INVESTMENT DISCARD NORMAL (FRACTION/YEAR)       3200
*     CIDN1 = CAPITAL-INVESTMENT DISCARD NORMAL NO. 1 (FRACTION/YEAR) 3300
*     CIDNT5= CIDN1, IF(SWT5.LT.T)
*           = CIDN1, IF(SWT5.EQ.T)
*           = CIDN , IF(SWT5.GT.T)
*     CIG   = CAPITAL-INVESTMENT GENERATION (CAPITAL UNITS/YEAR)      3400
*     CIGN  = CAPITAL-INVESTMENT GENERATION NORMAL                    3500
*                 (CAPITAL UNITS/PERSON/YEAR)                         3600
*     CIGN1 = CAPITAL-INVESTMENT GENERATION NORMAL NO. 1              3700
*                 (CAPITAL UNITS/PERSON/YEAR)                         3800
*     CIGNT4= CIGN1, IF(SWT4.LT.T)
*           = CIGN1, IF(SWT4.EQ.T)
*           = CIGN , IF(SWT4.GT.T)
*     CIM   = CAPITAL-INVESTMENT MULTIPLIER (DIMENSIONLESS)           4000
*     CIMT  = CAPITAL-INVESTMENT-MULTIPLIER TABLE                     4100
*     CIR   = CAPITAL-INVESTMENT RATIO (CAPITAL UNITS/PERSON)         4400
*     CIRA  = CAPITAL-INVESTMENT RATIO IN AGRICULTURE                 4500
*                 (CAPITAL UNITS/PERSON)                              4600
*     CIRAX = LIMITED VALUE OF "CIRA" (CAPITAL UNITS/PERSON)
*           = 0.0, IF(CIRA.LT.0.0)
*           = 6.0, IF(CIRA.GT.6.0)
*           = CIRA, IF(CIRA.GE.0.0.AND.CIRA.LE.6.0)
*     CIRX  = LIMITED VALUE OF "CIR" (CAPITAL UNITS/PERSON)
*           = 0.0, IF(CIR.LT.0.0)
*           = 5.0, IF(CIR.GE.5.0)
*           = CIR, IF(CIR.GE.0.0.AND.CIR.LE.5.0)
*     SWT4  = SWITCH TIME NO. 4 FOR CIGN (YEARS)                     11400
*     SWT5  = SWITCH TIME NO. 5 FOR CIDN (YEARS)                     11500
*                                                                    22200
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*-----------------------------------------------------------------------------
* 5.2 CAPITAL-INVESTMENT-IN-AGRICULTURE-FRACTION (CIAF)
*-----------------------------------------------------------------------------
*                                                                        6900
*     (SECTION 3.4, 3.5, 3.35, 3.43 OF REFERENCE)
*
*     CAPITAL-INVESTMENT-IN-AGRICULTURE-FRACTION (CIAF) IS A SYSTEM LEVEL
*     AND IT IS GENERATED AS A GRADUAL ADJUSTMENT
*     OF THE ACTUAL FRACTION OF CAPITAL IN AGRICULTURE AS IT MOVES        500
*     TOWARD THE FRACTION THAT IS CALLED FOR BY CURRENT CONDITIONS.  THE   600
*     TOTAL EFFECT OF COMPUTING (CIAF) IS TO GIVE FOOD A PRIORITY OVER
*     MATERIAL GOODS SO THAT THE MOST PRESSING NECESSITY OF LIFE GETS      800
*     PREFERRED CLAIM ON THE CAPITAL PLANT OF THE WORLD.                   900
*
*     ------------------------------------------------------------------
*
      CFIFR = AFGEN(CFIFRT,  FRXX)                                       5800
      CIAF  = INTGRL(CIAFI,(CFIFR*CIQR-CIAF)/CIAFT)                      5400
      CIQR  = AFGEN( CIQRT,    Q9)                                       5900
      ECIR  = CIR*(1.0-CIAF)*NREM/(1.0-CIAFN)                            3400
      MSL   = ECIR/ECIRN                                                 3300
      MSLX  = LIMIT( C.0, 5.0,   MSL)                                     100
      MSLXX = LIMIT( 0.0,70.0,   MSL)                                     750
      Q9    = LIMIT( C.C, 2.0, CLM/CLF)                                   550
*
*     ------------------------------------------------------------------
*
PARAMETER  CIAFN =   C.30COE+00, CIAFT =  15.COOCE+CC,...                6200
           ECIRN =   1.COOOE+00
*
FUNCTION  CFIFRT= (  C.C ,  1.C ), (  C.5 ,  0.6 ), (  1.0 ,  0.3 ),...
                 (  1.5 ,  C.15), (  2.0 ,  0.1 )
FUNCTION  CIQRT = (  0.C ,  0.7 ), (  C.5 ,  C.8 ), (  1.0 ,  1.0 ),...
                 (  1.5 ,  1.5 ), (  2.0 ,  2.0 )
*                                                                        1500
*     ------------------------------------------------------------------
*
*     CFIFR = CAPITAL FRACTION INDICATED BY FOOD RATIO (DIMENSIONLESS)    2100
*     CFIFRT= CAPITAL-FRACTION-INDICATED-BY-FOOD-RATIO TABLE              2200
*     CIAF  = CAPITAL-INVESTMENT-IN-AGRICULTURE FRACTION (DIMENSIONLESS)  2400
*     CIAFN = CAPITAL-INVESTMENT-IN-AGRICULTURE FRACTION NORMAL           2700
*                (DIMENSIONLESS)                                          2800
*     CIAFT = CAPITAL-INVESTMENT-IN-AGRICULTURE-FRACTION ADJUSTMENT TIME  2900
*                (YEARS)                                                  3000
*     CIQR  = CAPITAL-INVESTMENT-FROM-QUALITY RATIO (DIMENSIONLESS)       4200
*     CIQRT = CAPITAL-INVESTMENT-FROM-QUALITY-RATIO TABLE                 4300
*     ECIR  = EFFECTIVE-CAPITAL-INVESTMENT RATIO (CAPITAL UNITS/PERSON)   5900
*     ECIRN = EFFECTIVE-CAPITAL-INVESTMENT RATIO NORMAL                   6000
*     MSL   = MATERIAL STANDARD OF LIVING (DIMENSIONLESS)                 7300
*                (CAPITAL UNITS/PERSON)                                   6050
*     MSLX  = LIMITED VALUE OF "MSL" (DIMENSIONLESS)
*           = 0.0, IF(MSL.LT.C.0)
*           = 5.0, IF(MSL.GT.5.0)
*           = MSL, IF(MSL.GE.3.3.AND.MSL.LE.5.0)
*     MSLXX = LIMITED VALUE OF "MSL" (DIMENSIONLESS)
*           = 0.0, IF(MSL.LT.0.0)
*           = 7C.0, IF(MSL.GT.7C.0)
*           = MSL, IF(MSL.GE.0.0.ANC.MSL.LE.5.0)
*     Q9    = LIMITED VALUE OF "CLM/CLF" (DIMENTIONLESS)
*           = 0.0, IF(CLM/CLF.LT.0.C)
*           = 2.0, IF(CLM/CLF.GT.2.0)

*           = CLM/CLF, IF(CLM/CLF.GE.C.C AND CLM/CLF.LE.2.0)
*
*-----------------------------------------------------------------------------
* 6.  POLLUTION (POL)
*-----------------------------------------------------------------------------
*
*     (SECTION 3.29, 3.3C, 3.31, 3.32, 3.33, 3.34 OF REFERENCE)
*
*     POLLUTION (POL) IS ONE OF THE FIVE SYSTEM LEVELS.  IT IS A POOL
*     WHICH POLLUTION GENERATION INCREASES AND WHICH POLLUTION            900
*     ABSORPTION EMPTIES.  POLLUTION (POL) REPRESENTS THE ACTIVE POLLUTION
*     IN THE ENVIRONMENT AS IT EXISTS AFTER GENERATION AND BEFORE         100
*     DISSIPATION INTO SOME HARMLESS AND INACTIVE FORM.                   200
*
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*     ------------------------------------------------------------------
*
      POL = INTGRL(PCLI,PCLG-PCLA)                                    3900
      POLA  = POL/POLAT                                               4100
      POLAT = AFGEN(POLATT, POLRX)                                    4200
      POLCM = AFGEN(POLCMT,  CIRX)                                    4300
      PCLG  = P*PCLNT6*POLCM
      PCLNT6= FCNSW(SWT6-T,PCLN1,POLN1,PCLN)
      POLR  = PCL/PCLS                                                3800
      POLRX = LIMIT( C.0,60.0,  POLR)                                  300
*
*     ------------------------------------------------------------------
*
PARAMETER  POLN  =   1.COCCE+OC, POLN1 =   1.CCCCE+CC,...             4400
           POLS  =   3.6000E+09, SWT6  = 197.0000E+01                 4500
*
FUNCTION  POLATT= (  0.0 ,  0.6 ), ( 10.0 ,  2.5 ), ( 20.0 ,  5.0 ),...
                  ( 30.0 ,  8.0 ), ( 40.0 , 11.5 ), ( 50.0 , 15.5 ),...
                  ( 60.C , 20.0 )
FUNCTION  POLCMT= (  C.C ,  0.05), (  1.0 ,  1.C ), (  2.0 ,  3.0 ),...
                  (  3.0 ,  5.4 ), (  4.0 ,  7.4 ), (  5.0 ,  8.0 )
*
*     ------------------------------------------------------------------
*
*     PCL   = POLLUTION (POLLUTION UNITS)                             8900
*     POLA  = POLLUTION ABSORPTION (POLLUTION UNITS/YEAR)             9000
*     POLAT = POLLUTION-ABSORPTION TIME (YEARS)                       9100
*     POLATT= POLLUTION-ABSORPTION-TIME TABLE                         9200
*     POLCM = POLLUTION-FROM-CAPITAL MULTIPLIER (DIMENSIONLESS)       9300
*     POLCMT= POLLUTION-FROM-CAPITAL-MULTIPLIER TABLE                 9400
*     POLG  = POLLUTION GENERATION (POLLUTION UNITS/YEAR)             9500
*     PCLN  = POLLUTION NORMAL (POLLUTION UNITS/PERSON/YEAR)          9700
*     PCLN1 = POLLUTION NORMAL NO. 1 (POLLUTION UNITS/PERSON/YEAR)    9800
*     PCLNT6= PCLN1, IF(SWT6.LT.T)
*           = PCLN1, IF(SWT6.EQ.T)
*           = PCLN , IF(SWT6.GT.T)
*     POLR  = POLLUTION RATIO (DIMENSIONLESS)                         9900
*     POLRX = LIMITED VALUE OF "POLR" (DIMENTIONLESS)
*           = C.0, IF(POLR.LT.0.0)
*           = 60.0. IF(POLR.GT.60.0)
*           = POLR, IF(POLR.GE.0.0 AND POLR.LE.60.0)
*     POLS  = POLLUTION STANDARD (POLLUTION UNITS)                   10000
*     SWT6  = SWITCH TIME NO. 6 FOR PCLN (YEARS)                     11600
*
*

*-----------------------------------------------------------------------------
* 7.  FOOD RATIO (FR)
*-----------------------------------------------------------------------------
*
*     (SECTION 3.19, 3.20, 3.21, 3.28 OF REFERENCE)
*
*     THE FOOD RATIO GIVES THE FOOD PER CAPITA IN TERMS OF THE AVERAGE
*     FOR THE WORLD IN 1970. IT IS A DIMENTIONLESS RATIO OBTAINED BY DIVIDING
*     THE FOOD POTENTIAL FROM CAPITAL INVESTMENT (FPCI) BY THE 1970 FOOD
*     NORMAL (FN) AND THEN MULTIPLYING BY THE INFLUENCES OF CROWDING AND
*     POLLUTION AND BY A FOOD COEFFICIENT (FC).
*
*     ------------------------------------------------------------------
*
      FR    = FPCI*FCM*FPM*FCT7/FN
      FCT7  = FCNSW(SWT7-T,FC1,FC1,FC)
      FCM   = AFGEN(  FCMT,   CRX)                                    2900
      FPCI  = AFGEN( FPCIT, CIRAX)                                    2800
      FPM   = AFGEN(  FPMT, POLRX)                                    3000
      FRX   = LIMIT( 0.0, 4.0,    FR)                                  000
      FRXX  = LIMIT( 0.0, 2.0,    FR)                                  400
*
*     ------------------------------------------------------------------
*
PARAMETER  FC1   =   1.COCCE+OO, FN    =   1.CCCCE+CC,...
           FC    =   1.0000E+00, SWT7  = 197.0000E+01
*
```

```
FUNCTION  FCMT  = (  0.0 ,  2.4 ), (  1.0 ,  1.0 ), (  2.0 ,  0.6 ),...
                  (  3.0 ,  0.4 ), (  4.0 ,  0.3 ), (  5.0 ,  0.2 )
FUNCTION  FPCIT = (  0.0 ,  0.5 ), (  1.0 ,  1.0 ), (  2.0 ,  1.4 ),...
                  (  3.0 ,  1.7 ), (  4.0 ,  1.9 ), (  5.0 ,  2.05),...
                  (  6.0 ,  2.2 )
FUNCTION  FPMT  = (  0.0 ,  1.02), ( 10.0 ,  0.9 ), ( 20.0 ,  0.65),...
                  ( 30.0 ,  0.35), ( 40.0 ,  0.2 ), ( 50.0 ,  0.1 ),...
                  ( 60.0 ,  0.05)
*
*     ----------------------------------------------------------------
*
*     FC    = FOOD COEFFICIENT (DIMENSIONLESS)                          6150
*     FCM   = FOOD-FROM-CROWDING MULTIPLIER (DIMENSIONLESS)             6350
*     FCMT  = FOOD-FROM-CROWDING-MULTIPLIER TABLE                       6450
*     FC1   = FOOD COEFFICIENT NO. 1 (DIMENSIONLESS)                    6250
*     FCT7  = FC1, IF(SWT7.LT.T)
*           = FC1, IF(SWT7.EQ.T)
*           = FC , IF(SWT7.GT.T)
*     FN    = FOOD NORMAL (FOOD UNITS/PERSON/YEAR)                      6550
*     FPCI  = FOOD POTENTIAL FROM CAPITAL INVESTMENT                    6650
*             (FOOD UNITS/PERSON/YEAR)                                  6750
*     FPCIT = FOOD-POTENTIAL-FROM-CAPITAL-INVESTMENT TABLE              6850
*     FPM   = FOOD-FROM-POLLUTION MULTIPLIER (DIMENSIONLESS)            6950
*     FPMT  = FOOD-FROM-POLLUTION-MULTIPLIER TABLE                      7000
*     FR    = FOOD RATIO (DIMENSIONLESS)                                7100
*     FRX   = LIMITED VALUE OF "FR" (DIMENSIONLESS)
*           = 0.0, IF(FR.LT.0.0)
*           = 4.0, IF(FR.GT.4.0)
*           = FR , IF(FR.GE.0.0.AND.FR.LE.4.0)
*     FRXX  = LIMITED VALUE OF "FR" (DIMENSIONLESS)
*           = 0.0, IF(FR.LT.0.0)
*           = 2.0, IF(FR.GT.2.0)
*           = FR, IF(FR.GE.0.0.AND.FR.LE.2.0)
*     SWT7  = SWITCH TIME NO. 7 FOR FC (YEARS)                         11700
*
*--------------------------------------------------------------------------
* 8.  QUALITY OF LIFE (QL)
*--------------------------------------------------------------------------
*
*     (SECTION 3.37, 3.38, 3.39, 3.40, 3.41 OF REFERENCE)
*                                                                       5860
*     QUALITY OF LIFE (QL) IS USED HERE AS A MEASURE OF PERFORMANCE OF THE
*     WORLD SYSTEM.  IT IS COMPUTED AS A QUALITY-OF-LIFE STANDARD (QLS)
*     MULTIPLIED BY FOUR MULTIPLIERS DERIVED FROM MATERIAL STANDARD OF   300
*     LIVING, CROWDING, FOOD, AND POLLUTION.                             400
*
*     ----------------------------------------------------------------
*
      QL    = QLS*QLM*QLC*QLF*QLP                                       4600
      QLC   = AFGEN( QLCT,   CRX)                                       4800
      QLF   = AFGEN( QLFT,   FRX)                                       4900
      QLM   = AFGEN( QLMT,  MSLX)                                       4700
      QLP   = AFGEN( QLPT, POLRX)                                       4950
*
*     ----------------------------------------------------------------
*
PARAMETER  QLS   =   1.0000E+00                                         5000
*                                                                       1250
FUNCTION  QLCT  = (  0.0 ,  2.0 ), (  0.5 ,  1.3 ), (  1.0 ,  1.0 ),...
                  (  1.5 ,  0.75), (  2.0 ,  0.55), (  2.5 ,  0.45),...
                  (  3.0 ,  0.38), (  3.5 ,  0.3 ), (  4.0 ,  0.25),...
                  (  4.5 ,  0.22), (  5.0 ,  0.2 )
FUNCTION  QLFT  = (  0.0 ,  0.0 ), (  1.0 ,  1.0 ), (  2.0 ,  1.8 ),...
                  (  3.0 ,  2.4 ), (  4.0 ,  2.7 )
FUNCTION  QLMT  = (  0.0 ,  0.2 ), (  1.0 ,  1.0 ), (  2.0 ,  1.7 ),...
                  (  3.0 ,  2.3 ), (  4.0 ,  2.7 ), (  5.0 ,  2.9 )
FUNCTION  QLPT  = (  0.0 ,  1.04), ( 10.0 ,  0.85), ( 20.0 ,  0.6 ),...
                  ( 30.0 ,  0.3 ), ( 40.0 ,  0.15), ( 50.0 ,  0.05),...
                  ( 60.0 ,  0.02)
```

```
*     ------------------------------------------------------------------
*
*     QL    = QUALITY OF LIFE (SATISFACTION UNITS)                        10100
*     QLC   = QUALITY OF LIFE FROM CROWDING (DIMENSIONLESS)               10200
*     QLCT  = QUALITY-OF-LIFE-FROM-CROWDING TABLE                         10300
*     QLF   = QUALITY OF LIFE FROM FOOD (DIMENSIONLESS)                   10400
*     QLFT  = QUALITY-OF-LIFE-FROM-FOOD TABLE                             10500
*     QLM   = QUALITY OF LIFE FROM MATERIAL (DIMENSIONLESS)               10600
*     QLMT  = QUALITY-OF-LIFE-FROM-MATERIAL TABLE                         10700
*     QLP   = QUALITY OF LIFE FROM POLLUTION (DIMENSIONLESS)              10800
*     QLPT  = QUALITY-OF-LIFE-FROM-POLLUTION TABLE                        10900
*     QLS   = QUALITY-OF-LIFE STANDARD (SATISFACTION UNITS)               11000
*
*                                                                         9950
*-----------------------------------------------------------------------------
* 9.  DEFINITIONS OF TERMS (ALPHABETICAL ORDER)
*-----------------------------------------------------------------------------
*                                                                         17800
*** A
*** B
*     BR    = BIRTH RATE (PEOPLE/YEAR)                                    1000

*     BRCM  = BIRTH-RATE-FROM-CROWDING MULTIPLIER (DIMENSIONLESS)         1100
*     BRCMT = BIRTH-RATE-FROM-CROWDING-MULTIPLIER TABLE                   1200
*     BRFM  = BIRTH-RATE-FROM-FOOD MULTIPLIER (DIMENSIONLESS)             1300
*     BRFMT = BIRTH-RATE-FROM-FOOD-MULTIPLIER TABLE                       1400
*     BRMM  = BIRTH-RATE-FROM-MATERIAL MULTIPLIER (DIMENSIONLESS)         1500
*     BRMMT = BIRTH-RATE-FROM-MATERIAL-MULTIPLIER TABLE                   1600
*     BRN   = BIRTH RATE NORMAL (FRACTION/YEAR)                           1700
*     BRN1  = BIRTH RATE NORMAL NO. 1 (FRACTION/YEAR)                     1800
*     BRNT1 = BRN1, IF(SWT1.LT.T)
*           = BRN1, IF(SWT1.EQ.T)
*           = BRN , IF(SWT1.GT.T)
*     BRPM  = BIRTH-RATE-FROM-POLLUTION MULTIPLIER (DIMENSIONLESS)        1900
*     BRPMT = BIRTH-RATE-FROM-POLLUTION-MULTIPLIER TABLE                  2000
*** C
*     CFIFR = CAPITAL FRACTION INDICATED BY FOOD RATIO (DIMENSIONLESS)    2100
*     CFIFRT= CAPITAL-FRACTION-INDICATED-BY-FOOD-RATIO TABLE              2200
*     CI    = CAPITAL INVESTMENT (CAPITAL UNITS)                          2300
*     CIAF  = CAPITAL-INVESTMENT-IN-AGRICULTURE FRACTION (DIMENSIONLESS)  2400
*     CIAFI = CAPITAL-INVESTMENT-IN-AGRICULTURE FRACTION,  INITIAL        2500
*                (DIMENSIONLESS)                                          2600
*     CIAFN = CAPITAL-INVESTMENT-IN-AGRICULTURE FRACTION NORMAL           2700
*                (DIMENSIONLESS)                                          2800
*     CIAFT = CAPITAL-INVESTMENT-IN-AGRICULTURE-FRACTION ADJUSTMENT TIME  2900
*                (YEARS)                                                  3000
*     CID   = CAPITAL-INVESTMENT DISCARD (CAPITAL UNITS/YEAR)             3100
*     CIDN  = CAPITAL-INVESTMENT DISCARD NORMAL (FRACTION/YEAR)           3200
*     CIDN1 = CAPITAL-INVESTMENT DISCARD NORMAL NO. 1 (FRACTION/YEAR)     3300
*     CIDNT5= CIDN1, IF(SWT5.LT.T)
*           = CIDN1, IF(SWT5.EQ.T)
*           = CIDN , IF(SWT5.GT.T)
*     CIG   = CAPITAL-INVESTMENT GENERATION (CAPITAL UNITS/YEAR)          3400
*     CIGN  = CAPITAL-INVESTMENT GENERATION NORMAL                        3500
*                (CAPITAL UNITS/PERSON/YEAR)                              3600
*     CIGN1 = CAPITAL-INVESTMENT GENERATION NORMAL NO. 1                  3700
*                (CAPITAL UNITS/PERSON/YEAR)                              3800
*     CIGNT4= CIGN1, IF(SWT4.LT.T)
*           = CIGN1, IF(SWT4.EQ.T)
*           = CIGN , IF(SWT4.GT.T)
*     CII   = CAPITAL INVESTMENT,  INITIAL (CAPITAL UNITS)                3900
*     CIM   = CAPITAL-INVESTMENT MULTIPLIER (DIMENSIONLESS)               4000
*     CIMT  = CAPITAL-INVESTMENT-MULTIPLIER TABLE                         4100
*     CIQR  = CAPITAL-INVESTMENT-FROM-QUALITY RATIO (DIMENSIONLESS)       4200
*     CIQRT = CAPITAL-INVESTMENT-FROM-QUALITY-RATIO TABLE                 4300
*     CIR   = CAPITAL-INVESTMENT RATIO (CAPITAL UNITS/PERSON)             4400
*     CIRX  = LIMITED VALUE OF "CIR" (CAPITAL UNITS/PERSON)
*           = 0.0, IF(CIR.LT.0.0)
*           = 5.0, IF(CIR.GE.5.0)
*           = CIR, IF(CIR.GE.0.0.AND.CIR.LE.5.0)
*     CIRA  = CAPITAL-INVESTMENT RATIO IN AGRICULTURE                     4500
*                (CAPITAL UNITS/PERSON)                                   4600
*     CIRAX = LIMITED VALUE OF "CIRA" (CAPITAL UNITS/PERSON)
*           = 0.0, IF(CIRA.LT.0.0)
*           = 6.0, IF(CIRA.GT.6.0)
*           = CIRA, IF(CIRA.GE.0.0.AND.CIRA.LE.6.0)
```

```
*      CR     = CROWDING RATIO (DIMENSIONLESS)                                  4700
*      CRX    = LIMITED VALUE OF "CR" (DIMENTIONLESS)
*             = 0.0, IF(CR.LT.0.0)
*             = 5.0, IF(CR.GT.5.0)
*             = CR, IF(CR.GE.0.0.AND.CR.LE.5.0)

*** D
*      DR     = DEATH RATE (PEOPLE/YEAR)                                        4800
*      DRCM   = DEATH-RATE-FROM-CROWDING MULTIPLIER (DIMENSIONLESS)             4900
*      DRCMT  = DEATH-RATE-FROM-CROWDING-MULTIPLIER TABLE                       5000
*      DRFM   = DEATH-RATE-FROM-FOOD MULTIPLIER (DIMENSIONLESS)                 5100
*      DRFMT  = DEATH-RATE-FROM-FOOD-MULTIPLIER TABLE                           5200
*      DRMM   = DEATH-RATE-FROM-MATERIAL MULTIPLIER (DIMENSIONLESS)             5300
*      DRMMT  = DEATH-RATE-FROM-MATERIAL-MULTIPLIER TABLE                       5400
*      DRN    = DEATH RATE NORMAL (FRACTION/YEAR)                               5500
*      DRN1   = DEATH RATE NORMAL NO. 1 (FRACTION/YEAR)                         5600
*      DRNT3  = DRN1, IF(SWT3.LT.T)
*             = DRN1, IF(SWT3.EQ.T)
*             = DRN , IF(SWT3.GT.T)
*      DRPM   = DEATH-RATE-FROM-POLLUTION MULTIPLIER (DIMENSIONLESS)            5700
*      DRPMT  = DEATH-RATE-FROM-POLLUTION-MULTIPLIER TABLE                      5800
*** E
*      ECIR   = EFFECTIVE-CAPITAL-INVESTMENT RATIO (CAPITAL UNITS/PERSON)       5900
*      ECIRN  = EFFECTIVE-CAPITAL-INVESTMENT RATIO NORMAL                       6000
*                    (CAPITAL UNITS/PERSON)                                     6050
*** F
*      FC     = FOOD COEFFICIENT (DIMENSIONLESS)                                6150
*      FC1    = FOOD COEFFICIENT NO. 1 (DIMENSIONLESS)                          6250
*      FCM    = FOOD-FROM-CROWDING MULTIPLIER (DIMENSIONLESS)                   6350
*      FCMT   = FOOD-FROM-CROWDING-MULTIPLIER TABLE                             6450
*      FN     = FOOD NORMAL (FOOD UNITS/PERSON/YEAR)                            6550
*      FPCI   = FOOD POTENTIAL FROM CAPITAL INVESTMENT                          6650
*                    (FOOD UNITS/PERSON/YEAR)                                   6750
*      FPCIT  = FOOD-POTENTIAL-FROM-CAPITAL-INVESTMENT TABLE                    6850
*      FPM    = FOOD-FROM-POLLUTION MULTIPLIER (DIMENSIONLESS)                  6950
*      FPMT   = FOOD-FROM-POLLUTION-MULTIPLIER TABLE                            7000
*      FR     = FOOD RATIO (DIMENSIONLESS)                                      7100
*      FRX    = LIMITED VALUE OF "FR" (DIMENSIONLESS)
*             = 0.0, IF(FR.LT.0.0)
*             = 4.0, IF(FR.GT.4.0)
*             = FR , IF(FR.GE.0.0.AND.FR.LE.4.0)
*      FRXX   = LIMITED VALUE OF "FR" (DIMENSIONLESS)
*             = 0.0, IF(FR.LT.0.0)
*             = 2.0, IF(FR.GT.2.0)
*             = FR, IF(FR.GE.0.0.AND.FR.LE.2.0)
*** G
*** H
*** I
*** J
*** K
*** L
*      LA     = LAND AREA (SQUARE KILOMETERS)                                   7200
*** M
*      MSL    = MATERIAL STANDARD OF LIVING (DIMENSIONLESS)                     7300
*      MSLX   = LIMITED VALUE OF "MSL" (DIMENSIONLESS)
*             = 0.0, IF(MSL.LT.0.0)
*             = 5.0, IF(MSL.GT.5.0)
*             = MSL, IF(MSL.GE.3.3.AND.MSL.LE.5.0)
*      MSLXX  = LIMITED VALUE OF "MSL" (DIMENSIONLESS)
*             = 0.0, IF(MSL.LT.0.0)
*             = 70.0, IF(MSL.GT.70.0)
*             = MSL, IF(MSL.GE.0.0.AND.MSL.LE.5.0)
*** N
*      NR     = NATURAL RESOURCES (NATURAL RESOURCE UNITS)                      7400
*      NREM   = NATURAL-RESOURCE-EXTRACTION MULTIPLIER (DIMENSIONLESS)          7500

*      NREMT  = NATURAL-RESOURCE-EXTRACTION-MULTIPLIER TABLE                    7600
*      NRFR   = NATURAL-RESOURCE FRACTION REMAINING (DIMENSIONLESS)             7700
*      NRFRX  = LIMITED VALUE OF "NRFR" (DIMENTIONLESS)
*             = 0.0, IF(NRFR.LT.0.0)
*             = 1.0, IF(NRFR.GT.1.0)
*             = NRFR, IF(NRFR.GE.0.0.AND.NRFR.LE.1.0)
*      NRI    = NATURAL RESOURCE,  INITIAL (NATURAL RESOURCE UNITS)             7800
```

```
*      NRMM   = NATURAL-RESOURCE-FROM-MATERIAL MULTIPLIER (DIMENSIONLESS)      7900
*      NRMMT  = NATURAL-RESOURCE-FROM-MATERIAL-MULTIPLIER TABLE                8000
*      NRUN   = NATURAL-RESOURCE USAGE NORMAL                                  8100
*                    (NATURAL RESOURCE UNITS/PERSON/YEAR)                      8200
*      NRUN1  = NATURAL-RESOURCE USAGE NORMAL NO. 1                            8300
*                    (NATURAL RESOURCE UNITS/PERSON/YEAR)                      8400
*      NRUNT2= NRUN18 IF(SWT2.LT.T)
*            = NRUN1, IF(SWY2.EQ.T)
*            = NRUN , IF(SWT2.GT.T)
*      NRUR   = NATURAL-RESOURCE-USAGE RATE (NATURAL RESOURCE UNITS/YEAR)      8500
*** O
*** P
*      P      = POPULATION (PEOPLE)                                            8600
*      PDN    = POPULATION DENSITY NORMAL (PEOPLE/SQUARE KILOMETER)            8700
*      PI     = POPULATION,  INITIAL (PEOPLE)                                  8800
*      POL    = POLLUTION (POLLUTION UNITS)                                    8900
*      POLA   = POLLUTION ABSORPTION (POLLUTION UNITS/YEAR)                    9000
*      POLAT  = POLLUTION-ABSORPTION TIME (YEARS)                              9100
*      POLATT= POLLUTION-ABSORPTION-TIME TABLE                                 9200
*      POLCM  = POLLUTION-FROM-CAPITAL MULTIPLIER (DIMENSIONLESS)              9300
*      POLCMT= POLLUTION-FROM-CAPITAL-MULTIPLIER TABLE                         9400
*      POLG   = POLLUTION GENERATION (POLLUTION UNITS/YEAR)                    9500
*      POLI   = POLLUTION,  INITIAL (POLLUTION UNITS)                          9600
*      POLN   = POLLUTION NORMAL (POLLUTION UNITS/PERSON/YEAR)                 9700
*      POLN1  = POLLUTION NORMAL NO. 1 (POLLUTION UNITS/PERSON/YEAR)           9800
*      POLNT6= POLN1, IF(SWT6.LT.T)
*            = POLN1, IF(SWT6.EQ.T)
*            = POLN , IF(SWT6.GT.T)
*      POLR   = POLLUTION RATIO (DIMENSIONLESS)                                9900
*      POLRX  = LIMITED VALUE OF "POLR" (DIMENTIONLESS)
*            = 0.0, IF(POLR.LT.0.0)
*            = 60.0, IF(POLR.GT.60.0)
*            = POLR, IF(POLR.GE.0.0 AND POLR.LE.60.0)
*      POLS   = POLLUTION STANDARD (POLLUTION UNITS)                          10000
*** Q
*      Q9     = LIMITED VALUE OF "QLM/QLF" (DIMENTIONLESS)
*            = 0.0, IF(QLM/QLF.LT.0.0)
*            = 2.0, IF(QLM/QLF.GT.2.0)
*            = QLM/QLF, IF(QLM/QLF.GE.0.0 AND QLM/QLF.LE.2.0)
*      QL     = QUALITY OF LIFE (SATISFACTION UNITS)                          10100
*      QLC    = QUALITY OF LIFE FROM CROWDING (DIMENSIONLESS)                 10200
*      QLCT   = QUALITY-OF-LIFE-FROM-CROWDING TABLE                           10300
*      QLF    = QUALITY OF LIFE FROM FOOD (DIMENSIONLESS)                     10400
*      QLFT   = QUALITY-OF-LIFE-FROM-FOOD TABLE                               10500
*      QLM    = QUALITY OF LIFE FROM MATERIAL (DIMENSIONLESS)                 10600
*      QLMT   = QUALITY-OF-LIFE-FROM-MATERIAL TABLE                           10700
*      QLP    = QUALITY OF LIFE FROM POLLUTION (DIMENSIONLESS)                10800
*      QLPT   = QUALITY-OF-LIFE-FROM-POLLUTION TABLE                          10900
*      QLS    = QUALITY-OF-LIFE STANDARD (SATISFACTION UNITS)                 11000
*** R
*** S
*      SWT1   = SWITCH TIME NO. 1 FOR BRN (YEARS)                             11100

*      SWT2   = SWITCH TIME NO. 2 FOR NRUN (YEARS)                            11200
*      SWT3   = SWITCH TIME NO. 3 FOR BRN (YEARS)                             11300
*      SWT4   = SWITCH TIME NO. 4 FOR CIGN (YEARS)                            11400
*      SWT5   = SWITCH TIME NO. 5 FOR CIDN (YEARS)                            11500
*      SWT6   = SWITCH TIME NO. 6 FOR POLN (YEARS)                            11600
*      SWT7   = SWITCH TIME NO. 7 FOR FC (YEARS)                              11700
*** T
*      T      = CALENDAR TIME (YEARS)                                         11800
*** U
*** V
*** W
*** X
*** Y
*** Z
*                                                                             11650
```

```
*******************************************************************************
*******************************************************************************
TERMINAL SEGMENT
*******************************************************************************
*******************************************************************************
*                                                                        16200
*-------------------------------------------------------------------------------
* 10. CONTROL OF COMPUTER EXECUTION
*-------------------------------------------------------------------------------
*                                                                        23450
TIMER T    = 1900.0,  FINTIM = 2260.0,  DELT  = 0.4
*                                                                         1350
METHOD RECT                                                             23550
*                                                                         1050
*     ---------------------------------------------------------
*                                                                         6010
*     T      = TIME TO START SIMULATION AND OUTPUT RUN (YEARS)
*     FINTIM= FINAL TIME OF SIMULATION RUN (YEARS)
*     DELT   = TIME INTERVAL OF SIMULATION RUN (YEARS)
*     RECT   = RECTANGULAR INTEGRATION METHOD
*                                                                        24000
*-------------------------------------------------------------------------------
* 11. CONTROL OF COMPUTATIONAL OUTPUT
*-------------------------------------------------------------------------------
*                                                                        23300
TIMER OUTDEL = 4.0
OUTPUT P,POLR,CI,QL,NR                                                  24650
PAGE  SYMBOL=(P,2,C,Q,N)
LABEL CSMP-III SIMULATION OF WORLD DYNAMICS-2
LABEL P      = POPULATION,      POLR  = POLLUTION,
LABEL CI     = CAPITAL INVESTMENT,       QL    = QUALITY OF LIFE,
LABEL NR     = NATURAL RESOURCES
RANGE P,POLR,CI,QL,NR                                                   24850
*
*     ---------------------------------------------------------
*
*     OUTDEL= TIME INTERVAL OF COMPUTER OUTPUT (YEARS)
*     OUTPUT= COMMAND TO PLOT VARIABLES WHICH FOLLOW
*     PAGE  = COMMAND TO SYMBOLIZE THE OUTPUT VARIABLES
*     LABEL = HEADING AT THE TOP OF COMPUTER OUTPUT
*     RANGE = COMMAND TO LIST MAX. AND MIN. OF VARIABLES WHICH FOLLOW,
*             DURING SIMULATION RUN
*
*******************************************************************************

*
 END

OUTPUT VARIABLE SEQUENCE
CR      CRX     CRCM    FCT7    PCLR    PCLRX   FPM     FCM     CIR     CIRA
CIRAX   FPCI    FR      FRXX    CRFM    CRPM    NRFR    NRFRX   NREM    ECIR
MSL     MSLX    CRMM    CRNT3   CR      BRPM    BRCM    BRMM    FRX     BRFM
BRNT1   BR      ZZ1001  P       MSLXX   NRMM    NRLNT2  NRUR    ZZ1003  NR
CICNT5  CIC     CIM     CIGNT4  CIG     ZZ1005  CI      QLF     QLM     Q9
CIQR    CFIFR   ZZ1007  CIAF    PCLAT   PCLA    CIRX    PCLCM   PCLNT6  PCLG
ZZ1009  PCL     CLP     QLC     QL

 $$$ TRANSLATION TABLE CONTENTS $$$        CURRENT          MAXIMUM

   MACRO AND STATEMENT OUTPUTS              71                600
   STATEMENT INPUT WORK AREA               189               1900
   INTEGRATORS+MEMORY BLOCK OUTPUTS          5 +  0           300
   PARAMETERS+FUNCTION GENERATORS           38 + 22           400
   STORAGE VARIABLES+INTEGRATOR ARRAYS       0 +  0/2          50
   HISTORY AND MEMORY BLOCK NAMES           21                 50
   MACRO DEFINITIONS AND NESTED MACROS       6                 50
   MACRO STATEMENT STORAGE                  13                125
   LITERAL CONSTANT STORAGE                  0                100
   SORT SECTIONS                             1                 20
   MAXIMUM STATEMENTS IN SECTION            65                600



$$$END OF TRANSLATOR OUTPUT$$$
```

```
$$$CONTINUOUS SYSTEM MODELING PROGRAM  III   V1M0   TRANSLATOR OUTPUT$$$

*
*     APPENDIX
*                                                                          10350
*****************************************************************************
*****************************************************************************
*
* A-1 THE FOLLOWING IS THE PLOTTING SEGMENT OF AFGEN TABLES (1)
*
LABEL CSMP-III SIMULATION OF WORLD DYNAMICS-2     AFGEN TABLES (1)
*                                                                          22400
RENAME   TIME =     XX, FINTIM =  FINXX                                     3200
*
*****************************************************************************
*
***** FUNCTION GENERATION DATA
*                                                                          23000
FUNCTION  BRCMT = (  0.0 ,  1.05), (  1.0 ,  1.0 ), (  2.0 ,  0.9 ),...
                  (  3.0 ,  0.7 ), (  4.0 ,  0.6 ), (  5.0 ,  0.55),...
                  (  6.0 ,  0.55)
FUNCTION  BRFMT = (  0.0 ,  0.0 ), (  1.0 ,  1.0 ), (  2.0 ,  1.6 ),...
                  (  3.0 ,  1.9 ), (  4.0 ,  2.0 ), (  5.0 ,  2.0 )
FUNCTION  BRMMT = (  0.0 ,  1.2 ), (  1.0 ,  1.0 ), (  2.0 ,  0.85),...
                  (  3.0 ,  0.75), (  4.0 ,  0.7 ), (  5.0 ,  0.7 )
FUNCTION  CFIFRT= (  0.0 ,  1.0 ), (  0.5 ,  0.6 ), (  1.0 ,  0.3 ),...
                  (  1.5 ,  0.15), (  2.0 ,  0.1 ), (  2.5 ,  0.1 )
FUNCTION  CIMT  = (  0.0 ,  0.1 ), (  1.0 ,  1.0 ), (  2.0 ,  1.8 ),...
                  (  3.0 ,  2.4 ), (  4.0 ,  2.8 ), (  5.0 ,  3.0 ),...
                  (  6.0 ,  3.0 )
FUNCTION  CIQRT = (  0.0 ,  0.7 ), (  0.5 ,  0.8 ), (  1.0 ,  1.0 ),...
                  (  1.5 ,  1.5 ), (  2.0 ,  2.0 ), (  2.5 ,  2.0 )
FUNCTION  DRCMT = (  0.0 ,  0.9 ), (  1.0 ,  1.0 ), (  2.0 ,  1.2 ),...
                  (  3.0 ,  1.5 ), (  4.0 ,  1.9 ), (  5.0 ,  3.0 ),...
                  (  6.0 ,  3.0 )
FUNCTION  DRFMT = (  0.0 , 30.0 ), (  0.25,  3.0 ), (  0.5 ,  2.0 ),...
                  (  0.75,  1.4 ), (  1.0 ,  1.0 ), (  1.25,  0.7 ),...
                  (  1.5 ,  0.6 ), (  1.75,  0.5 ), (  2.0 ,  0.5 )
FUNCTION  DRMMT = (  0.0 ,  3.0 ), (  0.5 ,  1.8 ), (  1.0 ,  1.0 ),...
                  (  1.5 ,  0.8 ), (  2.0 ,  0.7 ), (  2.5 ,  0.6 ),...
                  (  3.0 ,  0.53), (  3.5 ,  0.5 ), (  4.0 ,  0.5 ),...
                  (  4.5 ,  0.5 ), (  5.0 ,  0.5 )
FUNCTION  FCMT  = (  0.0 ,  2.4 ), (  1.0 ,  1.0 ), (  2.0 ,  0.6 ),...
                  (  3.0 ,  0.4 ), (  4.0 ,  0.3 ), (  5.0 ,  0.2 ),...
                  (  6.0 ,  0.2 )
FUNCTION  FPCIT = (  0.0 ,  0.5 ), (  1.0 ,  1.0 ), (  2.0 ,  1.4 ),...
                  (  3.0 ,  1.7 ), (  4.0 ,  1.9 ), (  5.0 ,  2.05),...
                  (  6.0 ,  2.2 )
FUNCTION  NREMT = (  0.0 ,  0.0 ), (  0.25,  0.15), (  0.5 ,  0.5 ),...
                  (  0.75,  0.85), (  1.0 ,  1.0 ), (  1.25,  1.0 )
FUNCTION  PCLCMT= (  0.0 ,  0.05), (  1.0 ,  1.0 ), (  2.0 ,  3.0 ),...
                  (  3.0 ,  5.4 ), (  4.0 ,  7.4 ), (  5.0 ,  8.0 ),...
                  (  6.0 ,  8.0 )
FUNCTION  QLCT  = (  0.0 ,  2.0 ), (  0.5 ,  1.3 ), (  1.0 ,  1.0 ),...
                  (  1.5 ,  0.75), (  2.0 ,  0.55), (  2.5 ,  0.45),...
                  (  3.0 ,  0.38), (  3.5 ,  0.3 ), (  4.0 ,  0.25),...
                  (  4.5 ,  0.22), (  5.0 ,  0.2 ), (  5.5 ,  0.2 )
FUNCTION  QLFT  = (  0.0 ,  0.0 ), (  1.0 ,  1.0 ), (  2.0 ,  1.8 ),...
                  (  3.0 ,  2.4 ), (  4.0 ,  2.7 ), (  5.0 ,  2.7 )
FUNCTION  QLMT  = (  0.0 ,  0.2 ), (  1.0 ,  1.0 ), (  2.0 ,  1.7 ),...

                  (  3.0 ,  2.3 ), (  4.0 ,  2.7 ), (  5.0 ,  2.9 ),...
                  (  6.0 ,  2.9 )
*                                                                          2750
*****************************************************************************
*
      BRCM  = AFGEN( BRCMT,     XX)                                        1000
      BRFM  = AFGEN( BRFMT,     XX)                                        1100
      BRMM  = AFGEN( BRMMT,     XX)                                        1200
      CFIFR = AFGEN(CFIFRT,     XX)                                        1400
      CIM   = AFGEN(  CIMT,     XX)                                        1500
      CIQR  = AFGEN( CIQRT,     XX)                                        1600
```

```
      DRCM  = AFGEN( DRCMT,    XX)                                          1700
      DRFM  = AFGEN( DRFMT,    XX)                                          1800
      DRMM  = AFGEN( DRMMT,    XX)                                          1900
      FCM   = AFGEN(  FCMT,    XX)                                          2100
      FPCI  = AFGEN( FPCIT,    XX)                                          2200
      NREM  = AFGEN( NREMT,    XX)                                          2400
      POLCM = AFGEN(POLCMT,    XX)                                          2700
      QLC   = AFGEN(  QLCT,    XX)                                          2800
      QLF   = AFGEN(  QLFT,    XX)                                          2900
      QLM   = AFGEN(  QLMT,    XX)                                          3000
*                                                                           2550
*******************************************************************************
*
TIMER   FINXX =   6.0 , OUTDEL =   0.25,    DELT =   0.25                   3300
*                                                                           2350
OUTPUT   BRCM,   BRFM,   BRMM                                               3800
PAGE   SYMBOL = (C,F,M)                                                     3900
LABEL  BIRTH-RATE-FROM-CROWDING-MULTIPLIER TABLE (BRCMT)
LABEL  BIRTH-RATE-FROM-FOOD-MULTIPLIER TABLE (BRFMT)
LABEL  BIRTH-RATE-FROM-FOOD-MULTIPLIER TABLE (BRMMT)
*                                                                           2150
OUTPUT  CFIFR,    CIM,   CIQR                                               4000
PAGE   SYMBOL = (F,M,C)                                                     4100
LABEL  CAPITAL-FRACTION-INDICATED-BY-FOOD-RATIO TABLE(CFIFRT)
LABEL  CAPITAL-INVESTMENT-MULTIPLIER TABLE (CIMT)
LABEL  CAPITAL-INVESTMENT-FROM-QUALITY RATIO TABLE (CIQRT)
*
OUTPUT   DRCM,   DRFM,   DRMM                                               4500
PAGE   SYMBOL = (C,F,M)                                                     4600
LABEL  DEATH-RATE-FROM-CROWDING-MULTIPLIER TABLE (DRCMT)
LABEL  DEATH-RATE-FROM-FOOD-MULTIPLIER TABLE (DRFMT)
LABEL  DEATH-RATE-FROM-MATERIAL-MULTIPLIER TABLE (DRMMT)
*
OUTPUT    FCM,   FPCI                                                       5000
PAGE   SYMBOL = (C,P)                                                       5100
LABEL  FOOD-FROM-CROWDING-MULTIPLIER TABLE (FCMT)
LABEL  FOOD-POTENTIAL-FROM-CAPITAL-INVESTMENT TABLE (FPCIT)
*
OUTPUT    QLC,    QLF,    QLM                                               5400
PAGE   SYMBOL = (C,F,M)                                                     5500
LABEL  QUALITY-OF-LIFE-FROM-CROWDING TABLE (QLCT)
LABEL  QUALITY-OF-LIFE-FROM-FOOD TABLE (QLFT)
LABEL  QUALITY-OF-LIFE-FROM-MATERIAL TABLE (QLMT)
*                                                                          12900
OUTPUT  POLCM,   NREM                                                       5900
PAGE   SYMBOL = (P,N)                                                       6000
LABEL  POLLUTION-FROM-CAPITAL-MULTIPLIER TABLE (POLCMT)
LABEL  NATURALRESOURCE-EXTRACTION-MULTIPLIER (NREMT)

*
*******************************************************************************
*                                                                           1700
END

OUTPUT VARIABLE SEQUENCE
BRCM   BRFM   BRMM   CFIFR  CIM    CIQR   DRCM   DRFM   DRMM   FCM
FPCI   NREM   POLCM  QLC    QLF    QLM

 $$$ TRANSLATION TABLE CONTENTS $$$       CURRENT          MAXIMUM

   MACRO AND STATEMENT OUTPUTS            22                600
   STATEMENT INPUT WORK AREA              63               1900
   INTEGRATORS+MEMORY BLOCK OUTPUTS        0 +  0           300
   PARAMETERS+FUNCTION GENERATORS          3 + 16           400
   STORAGE VARIABLES+INTEGRATOR ARRAYS     0 +  0/2          50
   HISTORY AND MEMORY BLOCK NAMES         21                50
   MACRO DEFINITIONS AND NESTED MACROS     6                50
   MACRO STATEMENT STORAGE                13               125
   LITERAL CONSTANT STORAGE                0               100
   SORT SECTIONS                           1                20
   MAXIMUM STATEMENTS IN SECTION          16               600



$$$END OF TRANSLATOR OUTPUT$$$
```

```
$$$CONTINUOUS SYSTEM MODELING PROGRAM  III   V1M0   TRANSLATOR OUTPUT$$$
*
*********************************************************************************
*********************************************************************************
*
* A-2 THE FOLLOWING IS THE PLOTTING SEGMENT OF AFGEN TABLES (2)
*
LABEL CSMP-III SIMULATION OF WORLD DYNAMICS-2     AFGEN TABLES (2)
*
RENAME   TIME =     XX, FINTIM =  FINXX                                        3200
*
*********************************************************************************
*                                                                               4200
***** FUNCTION GENERATION DATA
*
FUNCTION  BRPMT = (  0.0 ,  1.02), ( 10.0 ,  0.9 ), ( 20.0 ,  0.7 ),...
                  ( 30.0 ,  0.4 ), ( 40.0 ,  0.25), ( 50.0 ,  0.15),...
                  ( 60.0 ,  0.1 )
FUNCTION  DRPMT = (  0.0 ,  0.92), ( 10.0 ,  1.3 ), ( 20.0 ,  2.0 ),...
                  ( 30.0 ,  3.2 ), ( 40.0 ,  4.8 ), ( 50.0 ,  6.8 ),...
                  ( 60.0 ,  9.2 )
FUNCTION  FPMT  = (  0.0 ,  1.02), ( 10.0 ,  0.9 ), ( 20.0 ,  0.65),...
                  ( 30.0 ,  0.35), ( 40.0 ,  0.2 ), ( 50.0 ,  0.1 ),...
                  ( 60.0 ,  0.05)
FUNCTION  NRMMT = (  0.0 ,  0.0 ), (  1.0 ,  1.0 ), (  2.0 ,  1.8 ),...
                  (  3.0 ,  2.4 ), (  4.0 ,  2.9 ), (  5.0 ,  3.3 ),...
                  (  6.0 ,  3.6 ), (  7.0 ,  3.8 ), (  8.0 ,  3.9 ),...
                  (  9.0 ,  3.95), ( 10.0 ,  4.0 ), ( 11.0 ,  4.0 )
FUNCTION  POLATT= (  0.0 ,  0.6 ), ( 10.0 ,  2.5 ), ( 20.0 ,  5.0 ),...
                  ( 30.0 ,  8.0 ), ( 40.0 , 11.5 ), ( 50.0 , 15.5 ),...
                  ( 60.0 , 20.0 )
FUNCTION  QLPT  = (  0.0 ,  1.04), ( 10.0 ,  0.85), ( 20.0 ,  0.6 ),...
                  ( 30.0 ,  0.3 ), ( 40.0 ,  0.15), ( 50.0 ,  0.05),...
                  ( 60.0 ,  0.02)
*
*********************************************************************************
*                                                                               4500
      BRPM  = AFGEN( BRPMT,    XX)                                              1300
      DRPM  = AFGEN( DRPMT,    XX)                                              2000
      FPM   = AFGEN(  FPMT,    XX)                                              2300
      NRMM  = AFGEN( NRMMT,    XX)                                              2500
      POLAT = AFGEN(POLATT,    XX)                                              2600
      QLP   = AFGEN(  QLPT,    XX)                                              3100
*
*********************************************************************************
*
TIMER   FINXX =  60.0 , OUTDEL =   1.0 ,    DELT =   1.0                       3400
*
OUTPUT   BRPM,   DRPM                                                           6300
PAGE   SYMBOL = (B,D)                                                           6400
LABEL  BIRTH-RATE-FROM-POLLUTION MULTIPLIER TABLE (BRPMT)
LABEL  DEATH-RATE-FROM-POLLUTION MULTIPLIER TABLE (DRPMT)
*
OUTPUT    FPM,   NRMM                                                           6700
PAGE   SYMBOL = (F,N)                                                           6800
LABEL  FOOD-FROM-POLLUTION-MULTIPLIER TABLE (FPMT)
LABEL  NATURAL-RESOURCE-FROM-MATERIAL-MULTIPLIER TABLE (NRMMT)
*
OUTPUT  POLAT,    QLP                                                           7100

PAGE   SYMBOL = (P,Q)                                                           7200
LABEL  POLLUTION-ABSORPTION-TIME TABLE (POLATT)
LABEL  QUALITY-OF-LIFE-FROM-POLLUTION TABLE (QLPT)
*
*********************************************************************************
*
END                                                                             24900
STOP                                                                            24950
```

```
CSMP-III SIMULATION OF WORLD DYNAMICS-2
P    = POPULATION,     PCLR  = POLLUTION,
CI   = CAPITAL INVESTMENT,        CL    = QUALITY OF LIFE,
NR   = NATURAL RESOURCES

                    C.C              *N*=NR                  1.0000E 12
                    C.2500           *Q*=CL                  1.250
                    0.C              *C*=CI                  1.0000E 10
                    0.0              *2*=PCLR                6.000
                    1.50CCE 09       *P*=P                   7.50CCE C9

T          P                                                 PCLR          CI            CL            NR
1900.0     1.65000E 09 2C----------I----C-------I----------I-------N---I  5.55556E-02  4.00000E 08  0.61159       9.00000F 11
1904.0     1.63341E C9 2PC         I         C  I          I       N   I  8.98001E-02  4.78380E C8  0.65835       8.98020E 11
1908.0     1.6531CE C9 2PC         I          IC            I       N   I  0.10420      5.64657F C9  0.77266       8.95683E 11
1912.0     1.7010BE 09 2P C        I           I   C        I       N   I  0.12057      6.6C6573F C9  0.83505       8.92964E 11
1916.0     1.77246E 09 I2PC        I           I     C      I       N   I  0.13918      7.67575F CA  0.88155       8.89765E 11
1920.0     1.86257E C9 I2P C       I           I       C I  I       N   I  0.16034      8.8716SF C8  0.92572       8.86C89E 11
1924.0     1.96551E C9 I2 PC       I           I          QI I       N   I  0.18431      1.02069F 09  0.96340       8.81867E 11
1928.C     2.07583E C9 I2  PC      I           I            C     N   I  0.21141      1.1654CE C9  0.99516       8.77044E 11
1932.0     2.20454E C9 I2   PC     I           I            IC    N   I  0.24199      1.33445F 09  1.0240        8.71566E 11
1936.C     2.33863E C9 I 2   PC    I           I            I Q   N   I  0.27641      1.51651F C9  1.0428        8.65371E 11
1940.0     2.48104E 09 I-2----PC---I-----------I-----------I--Q---N-----I  0.31505      1.71767E C9  1.0548        8.58409E 11
1944.C     2.63C61E C9 I 2       C  I           I           I  C N         I  0.35830      1.93742F C9  1.060C        8.50624E 11
1948.0     2.78607E C9 I  2        C I          I           I  C N         I  0.40654      2.17657F C9  1.0588        8.41968E 11
1952.0     2.94955E C9 I  2         CI          I           I  CN          I  0.46014      2.43516F C9  1.0515        8.32400E 11
1956.0     3.10878E C9 I   2       IC          I           I  Q N         I  0.51943      2.71286F C9  1.0386        8.21885E 11
1960.0     3.27272E C9 I   2       I C         I           I  IC N        I  0.58473      3.00888E C9  1.0207        8.10399E 11
1964.0     3.43534E C9 I    2      I  PC        I           I  Q  N        I  0.65625      3.32186E C9  0.99726       7.97934E 11
1968.0     3.59C74E C9 I     2     I    C       I           I QI N        I  0.74043      3.66950F C9  0.97918       7.84504E 11
1972.0     3.75991E 09 I      2    I     PC     I           I QIN         I  0.87099      3.98961E C9  0.98119       7.70127E 11
1976.0     3.94C04E C9 I       2   I      P C    I          I QN          I  1.0139       4.34323E C9  0.96936       7.54762C 11
1980.0     4.12938E 09 I--------2--I--------P-CI----------Q-N-----------I  1.1739       4.7C875F C9  0.94555       7.38437E 11
1984.0     4.3C915E C9 I          21           P C          C NI          I  1.3541       5.08428F C9  0.92433       7.21172E 11
1988.0     4.48233E C9 I           2           P C    C  N  I            I  1.5572       5.46765E C9  0.90248       7.02991E 11
1992.0     4.6647CE C9 I           I 2         IP  C Q  N  I            I  1.7865       5.85656E C9  0.88058       6.83928E 11
1996.0     4.80127E C9 I           I  2        I P  CC N  I            I  2.0444       6.24622E C9  0.85182       6.64469E 11
2000.0     4.94CCBE C9 I           I   2       I  CP  NC  I            I  2.3264       6.62C69E C9  0.81749       6.43747E 11
2004.0     5.C5557E C9 I           I     2     I C  FN   C I           I  2.6281       6.97341E C9  0.78494       6.23128E 11
2008.0     5.15938E 09 I           I      Q    N     CI   I           I  2.9472       7.30044E 09  0.75493       6.02341E 11
2012.C     5.23666E C9 I           I      CI 2 A P      IC            I  3.2802       7.59750E C9  0.72753       5.81520E 11
2016.0     5.28231E 09 I           I      Q I   N 2P      I C         I  3.6246       7.86116F 09  0.70606       5.60853E 11
2020.0     5.29861E 09 I-----------I------C--I--N----P2---I--C---------I  3.9758       8.06758E C9  0.69035       5.40478E 11
2024.C     5.29041E C9 I           I      Q   IN    P    2I   C         I  4.3248       8.27528E 09  0.68067       5.20485E 11
2028.0     5.26144E C5 I           I      Q    N    P      I  2  C      I  4.6601       8.42319E C9  0.67587       5.00995E 11
2032.0     5.21489E 09 I           I      Q  NI     P      I    2C      I  4.9697       8.53104E 09  0.67318       4.82097E 11
2036.0     5.15282E C9 I           I      C  N I      P     I     C      I  5.2414       8.5992CE C9  0.67267       4.63854E 11
2040.0     5.07613E 09 I           I      Q N  I      P     I      C 2   I  5.4643       8.62840E C9  0.67387       4.46331E 11
2044.0     4.98894E 09 I           I      C N  I    P       I       C 2  I  5.6276       8.61975E C9  0.67614       4.29593E 11
2048.0     4.89479E C9 I           I      CN   I  P         I     C   2  I  5.7211       8.57515E 09  0.67879       4.13665E 11
2052.0     4.7966CE 09 I           I      A    I P           I     C   2  I  5.7380       8.49698F C9  0.68030       3.98574E 11
2056.0     4.69684E 09 I           I      NC   I P           I     C   2  I  5.6757       8.38767E C9  0.68326       3.84329E 11
2060.0     4.59745E 09 I-----------I------AC----IP----------I-----C---2--I  5.5367       8.25113F C9  0.68933       3.70992E 11
2064.0     4.49587E 09 I           I    AC        P          I   C     2   I  5.3286       8.08962F C9  0.69425       3.58362E 11
2068.0     4.4050IE C9 I           I    N C       PI         I C   2       I  5.0638       7.90645E C9  0.69787       3.46611E 11
2072.0     4.31327E C9 I           I    I N C     P 1        IC2           I  4.7577       7.70694E C9  0.70213       3.35650E 11
2076.0     4.22464E 09 I           I    I N C     P I            C         I  4.4260       7.48888E C9  0.71107       3.25449E 11
2080.0     4.13874E C9 I           I    I N C     P  I         2 CI         I  4.0859       7.26025E C9  0.72086       3.15974E 11
2084.0     4.055C6E 09 I           I    I  NC     P  I      2    C I        I  3.7501       7.02224E C9  0.73575       3.07188E 11
2088.0     3.97261E 09 I           I    I N C     P  I  2      C  I        I  3.4282       6.77745C C9  0.75713       2.99051E 11
2092.0     3.88558E 09 I           I    I NC      P     I2       C    I     I  3.1179       6.52823E C9  0.78776       2.91525E 11
2096.0     3.79482E 09 I           I    IN C      P     2I       C    I     I  2.8532       6.27665E 09  0.82037       2.84568E 11
2100.0     3.7C234E 09 I-----------INC--F----2--I-----C---------I----------I  2.6028F      6.02455E C9  0.85458       2.78141E 11
2104.0     3.60932E C9 I           INQ   P 2      I   C         I          I  2.3748       5.77237E C9  0.89100       2.72205E 11
2108.C     3.52233E C9 I           IAC P2         I  C          I          I  2.1665       5.52550C C9  0.92985       2.66724E 11
2112.0     3.45403E C9 I           NC P2          IC           I          I  1.9702       5.28162E C9  0.97277       2.61660E 11
2116.0     3.39388E C9 I           AC2P           C            I          I  1.7878       5.04345E C9  0.10208       2.56977E 11
2120.0     3.33721E 09 I           N2P            CI           I          I  1.6215       4.81187E 09  0.10660       2.52665E 11
2124.0     3.28253E C9 I           2N P           C I          I          I  1.4708       4.58748E C9  0.11107       2.48633E 11
2128.0     3.2272AE C9 I           2NI P          C  I         I          I  1.3348       4.37074E 09  0.11591       2.44923E 11
2132.0     3.17C2EE C9 I          2 NIP           C   I        I          I  1.2127       4.1611AE C9  0.12068       2.41488E 11
2136.0     3.11321E 09 I         2  NIP          C    I       I          I  1.1024       3.96103E 09  0.12602       2.38298E 11
2140.0     3.05671E 09 I-------2-CNP-----C------I-----------I----------I  1.0024       3.76833E 09  0.13144       2.35345E 11
2144.0     3.00C99E 09 I      2  CNP     C       I           I          I  0.91156      3.5P383E C9  0.13743       2.32604E 11
2148.0     2.94612E C9 I       2  CNI   C        I           I          I  0.82893      3.40749E C9  0.14379       2.30058E 11
2152.0     2.89216E 09 I       2  C NI  C        I           I          I  0.75366      3.23925F 09  0.15055       2.27693E 11
2156.0     2.83914E 09 I       2  CPNI  C        I           I          I  0.68503      3.07897E C9  0.15771       2.25493E 11
2160.0     2.78733E 09 I       2  CA I C         I           I          I  0.62243      2.92676E C9  0.16530       2.23438E 11
2164.0     2.73721E 09 I    2     CA IC          I           I          I  0.56548      2.78308E C9  0.17330       2.21500E 11
2168.0     2.68852E C9 I    2     CN C           I           I          I  0.51948      2.64753E C9  0.18171       2.19671E 11
2172.0     2.64C66E 09 I  2       CPN C          I           I          I  0.49111      2.51996E C9  0.19055       2.17944E 11
2176.0     2.5936CE C9 I  2       Q NCI          I           I          I  0.46690      2.3590CE C9  0.19982       2.16311E 11
2180.0     2.54756E 09 I--2------Q-NCI----------I-----------I----------I  0.44051      2.20827F 09  0.20964       2.14766E 11
2184.0     2.5026CE C9 I  2       C A I          I           I          I  0.41779      2.17797E C9  0.42305       2.13303E 11
2188.0     2.45873E C9 I  2       PC N I         I           I          I  0.39663      2.07678E C9  0.42068       2.11917E 11
2192.0     2.41595E C9 I  2       PQCN I         I           I          I  0.37688      1.98135E 09  0.41840       2.10603E 11
2196.0     2.37425E 09 I  2       PQCN I         I           I          I  0.35845      1.89135E 09  0.41625       2.09356E 11
2200.0     2.33363E C9 I  2       P C A I        I           I          I  0.34124      1.80644F C9  0.41422       2.08172E 11
2204.0     2.29407E 09 I  2       PCC N I        I           I          I  0.32515      1.72664F C9  0.41231       2.07046E 11
2208.0     2.25556E 09 I  2       PCC A I        I           I          I  0.31010      1.65C94E C9  0.41050       2.05975E 11
2212.0     2.21808E C9 I  2   P C  N I           I           I          I  0.29602      1.57973E 09  0.40879       2.04956E 11
2216.C     2.18162E 09 I  2   P C  A I           I           I          I  0.28283      1.51256E C9  0.40718       2.03983E 11
2220.0     2.14617E 09 I-2--P-C-N--I-----------I-----------I----------I  0.27047      1.44916E C9  0.40566       2.03056E 11
2224.0     2.11170E C9 I  2 P CC N  I           I           I          I  0.25888      1.38936E 09  0.40423       2.02172E 11
2228.0     2.07821E C9 I  2 P CC A  I           I           I          I  0.24800      1.33255E C9  0.40288       2.01323E 11
2232.0     2.04567E C9 I2   P CC N  I           I           I          I  0.23780      1.27969F C9  0.40162       2.00519E 11
2236.C     2.01407E C9 I2   P CC A  I           I           I          I  0.22821      1.22940E C9  0.40042       1.99746E 11
2240.0     1.98339E 09 I2 P C C N  I           I           I          I  0.21920      1.18193E 09  0.39930       1.99006E 11
2244.0     1.95361E C9 I2 P C C A  I           I           I          I  0.21073      1.1370PE C9  0.39824       1.98296E 11
2248.0     1.92471E C9 I2 P C C A  I           I           I          I  0.20276      1.09472E C9  0.39725       1.97615E 11
2252.0     1.89668E C9 I2 P C C A  I           I           I          I  0.19526      1.05470E C9  0.39632       1.96962E 11
2256.0     1.86949F 09 I2P C  C A  I           I           I          I  0.18820      1.01688E 09  0.39545       1.96334E 11
2260.0     1.84313E C9 I2F-C--C-A--I-----------I-----------I----------I  0.18154      9.81122E C8  0.39463       1.95730E 11
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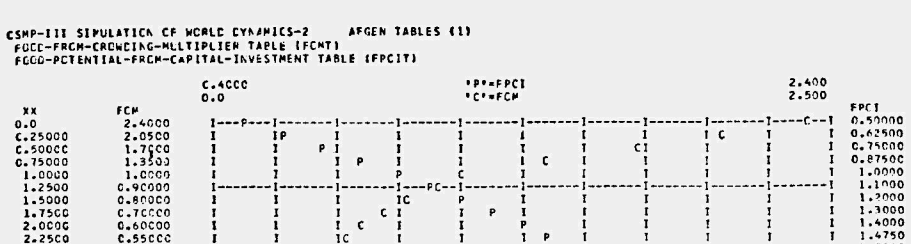
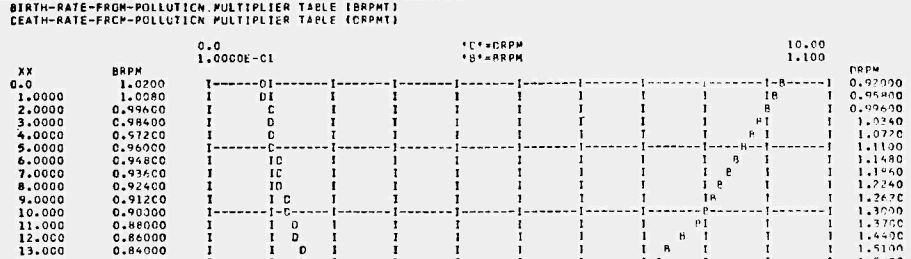
CSMP-III SIMULATION OF WORLD DYNAMICS-2 AFGEN TABLES (1)
FOOD-FROM-CROWDING-MULTIPLIER TABLE (FCMT)
FOOD-POTENTIAL-FROM-CAPITAL-INVESTMENT TABLE (FPCIT)



XX	FCM	FPCI
0.0	2.4000	0.50000
0.25000	2.0500	0.62500
0.50000	1.7500	0.75000
0.75000	1.3500	0.87500
1.0000	1.0000	1.0000
1.2500	0.90000	1.1000
1.5000	0.80000	1.2000
1.7500	0.70000	1.3000
2.0000	0.60000	1.4000
2.2500	0.55000	1.4750
2.5000	0.50000	1.5500
2.7500	0.45000	1.6250
3.0000	0.40000	1.7000
3.2500	0.37500	1.7500
3.5000	0.35000	1.8000
3.7500	0.32500	1.8500
4.0000	0.30000	1.9000
4.2500	0.27500	1.9375
4.5000	0.25000	1.9750
4.7500	0.22500	2.0125
5.0000	0.20000	2.0500
5.2500	0.20000	2.0875
5.5000	0.20000	2.1250
5.7500	0.20000	2.1625
6.0000	0.20000	2.2000

CSMP-III SIMULATION OF WORLD DYNAMICS-2 AFGEN TABLES (2)
BIRTH-RATE-FROM-POLLUTION MULTIPLIER TABLE (BRPMT)
DEATH-RATE-FROM-POLLUTION MULTIPLIER TABLE (DRPMT)



XX	BRPM	DRPM
0.0	1.0200	0.92000
1.0000	1.0080	0.95800
2.0000	0.99600	0.99600
3.0000	0.98400	1.0340
4.0000	0.9720	1.0720
5.0000	0.96000	1.1100
6.0000	0.94800	1.1480
7.0000	0.93600	1.1860
8.0000	0.92400	1.2240
9.0000	0.9120	1.2620
10.000	0.90000	1.3000
11.000	0.88000	1.3700
12.000	0.86000	1.4400
13.000	0.84000	1.5100
14.000	0.82000	1.5800
15.000	0.80000	1.6500
16.000	0.78000	1.7200
17.000	0.76000	1.7900
18.000	0.74000	1.8600
19.000	0.72000	1.9300
20.000	0.70000	2.0000
21.000	0.67000	2.1200
22.000	0.64000	2.2400
23.000	0.61000	2.3600
24.000	0.58000	2.4800
25.000	0.55000	2.6000
26.000	0.52000	2.7200
27.000	0.49000	2.8400
28.000	0.46000	2.9600
29.000	0.43000	3.0800
30.000	0.40000	3.2000
31.000	0.38500	3.3600
32.000	0.37000	3.5200
33.000	0.35500	3.6800
34.000	0.34000	3.8400
35.000	0.32500	4.0000
36.000	0.31000	4.1600
37.000	0.29500	4.3200
38.000	0.28000	4.4800
39.000	0.26500	4.6400
40.000	0.25000	4.8000
41.000	0.24000	5.0000
42.000	0.23000	5.2000
43.000	0.22000	5.4000
44.000	0.21000	5.6000
45.000	0.20000	5.8000
46.000	0.19000	6.0000
47.000	0.18000	6.2000
48.000	0.17000	6.4000
49.000	0.16000	6.6000
50.000	0.15000	6.8000
51.000	0.14500	7.0400
52.000	0.14000	7.2800
53.000	0.13500	7.5200
54.000	0.13000	7.7600
55.000	0.12500	8.0000
56.000	0.12000	8.2400
57.000	0.11500	8.4800
58.000	0.11000	8.7200
59.000	0.10500	8.9600
60.000	1.000000E-01	9.2000