

{ VERSION 10.0.6 }

{ INITIALIZATION EQUATIONS }

: f grow = 0

UNITS: bits/s

: s GrHouse\_Energy = 1e+21

UNITS: joules (j)

DOCUMENT: set at 1e+21 joules to start with

: s DNA\_Data = 1

UNITS: bits

: f decay = DNA\_Data \* GrHouse\_Energy \* 0

UNITS: bits/s

: s Human\_Data = 2.36e+21

UNITS: bits

DOCUMENT: Data from: The Worlds Technological Capacity to Store, Communicate, and Compute Information, Martin Hilbert and Priscila Lopez, Science Express Journal, Feb 16 2011.

Initial for 2007 2.36e+21 bits.

: s Energy\_Input = 1.74e+17

UNITS: joules (j)

: f convert = Energy\_Input

UNITS: j/s

: c reflected = 0.3

UNITS: dimensionless

DOCUMENT: Fixed at 30%, but can be made to spike in order to simulate snow cover, or volcanic dust.

: c solar\_variation = 1

UNITS: dimensionless

: f receive = 1.74e+17\*solar\_variation

UNITS: j/s

DOCUMENT: insolation is taken as 1.74e+17 W

: f retain = ( convert - ( receive \* (1-reflected) )) \* (0.00078 \* DNA\_Data) + (convert - ( receive \* (1-reflected) )) \* (0 \*Human\_Data)

UNITS: j/s

DOCUMENT: factor 0.00078 \* DNA\_Data gives the 9.5004e+13 W absorbed by biomass.

: f retrieve = (DNA\_Data \* 9.5004e+13) + (Human\_Data \* 6.8029559438124e-09\*(1+9.210942525e-08))

UNITS: j/s

DOCUMENT: biomass energy + (Human\_Data \* 6.8029559438124e-09 \* 7.21e-08) is 16TW primary energy use \* growth factor fossil energy use per second

: s Energy\_Output = 1.7e+17

UNITS: joules (j)

: f emitA = Energy\_Output - retain

UNITS: j/s

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: s Stored_Energy = 1e+24
UNITS: joules (j)
DOCUMENT: set at 1e+24 joules to start with
: f emitZ = (Stored_Energy/(GrHouse_Energy*1000))*emitA
UNITS: j/s
: f create = Human_Data*7.29325215626586e-8
UNITS: bits
DOCUMENT: Compound growth rate from 1986 till 2007 23% per year.
Initial for 2007 2.36e+21 bits.
One hour run with time-steps of one second adds 6.1964e+16.
In bytes (*8) this is 7.75 TB per hour.
: f destroy = Human_Data * GrHouse_Energy * 0
UNITS: bits/s
: s Energy__to_Space = - 1e-14
UNITS: joules (j)
: s Sun's_Energy_Stock = 1e+36
UNITS: joules (j)
: c activity_index = convert + ( DNA_Data - PREVIOUS( DNA_Data , 1 ) ) +
( Human_Data - PREVIOUS( Human_Data , 1 ) )
UNITS: dimensionless

{ RUNTIME EQUATIONS }
: s GrHouse_Energy(t) = GrHouse_Energy(t - dt) + (emitA - emitZ) * dt
UNITS: joules (j)
DOCUMENT: set at 1e+21 joules to start with
: s DNA_Data(t) = DNA_Data(t - dt) + (grow - decay) * dt
UNITS: bits
: s Human_Data(t) = Human_Data(t - dt) + (create - destroy) * dt
UNITS: bits
DOCUMENT: Data from: The Worlds Technological Capacity to Store,
Communicate, and Compute Information, Martin Hilbert and Priscila Lopez,
Science Express Journal, Feb 16 2011.
Initial for 2007 2.36e+21 bits.
: s Energy_Input(t) = Energy_Input(t - dt) + (retrieve + receive - convert) *
dt
UNITS: joules (j)
: s Energy_Output(t) = Energy_Output(t - dt) + (convert - emitA - retain) *
dt
UNITS: joules (j)
: s Stored_Energy(t) = Stored_Energy(t - dt) + (retain - retrieve) * dt
UNITS: joules (j)
DOCUMENT: set at 1e+24 joules to start with
: s Energy__to_Space(t) = Energy__to_Space(t - dt) + (emitZ) * dt
UNITS: joules (j)
: s Sun's_Energy_Stock(t) = Sun's_Energy_Stock(t - dt) + (-receive) * dt
UNITS: joules (j)

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: f convert = Energy\_Input  
UNITS: j/s  
: f receive = 1.74e+17\*solar\_variation  
UNITS: j/s  
DOCUMENT: insolation is taken as 1.74e+17 W  
: f retain = ( convert - ( receive \* (1-reflected) )) \* (0.00078 \* DNA\_Data)  
+ (convert - ( receive \* (1-reflected) )) \* (0 \*Human\_Data)  
UNITS: j/s  
DOCUMENT: factor 0.00078 \* DNA\_Data gives the 9.5004e+13 W absorbed by  
biomass.

: f retrieve = (DNA\_Data \* 9.5004e+13) + (Human\_Data \*  
6.8029559438124e-09\*(1+9.210942525e-08))  
UNITS: j/s  
DOCUMENT: biomass energy + (Human\_Data \* 6.8029559438124e-09 \* 7.21e-08) is  
16TW primary energy use \* growth factor fossil energy use per second  
: f emitA = Energy\_Output - retain  
UNITS: j/s  
: f emitZ = (Stored\_Energy/(GrHouse\_Energy\*1000))\*emitA  
UNITS: j/s  
: f create = Human\_Data\*7.29325215626586e-8  
UNITS: bits  
DOCUMENT: Compound growth rate from 1986 till 2007 23% per year.  
Initial for 2007 2.36e+21 bits.  
One hour run with time-steps of one second adds 6.1964e+16.  
In bytes (\*8) this is 7.75 TB per hour.  
: c activity\_index = convert + ( DNA\_Data - PREVIOUS( DNA\_Data , 1 ) ) +  
( Human\_Data - PREVIOUS( Human\_Data , 1 ) )  
UNITS: dimensionless

{ TIME SPECS }  
STARTTIME=0  
STOPTIME=360  
DT=1.00  
INTEGRATION=EULER  
RUNMODE=NORMAL  
PAUSEINTERVAL=INF