Ozone Model Text File

politicians sensitivity to interest groups=
1
~ Dmnl
~ The amount of political willingness increased per unit influence of ODS \
regulation groups.
|

"amount of pro-ODS regulation influence"=
0.1+RAMP(0.08 , 1975 , 1985)
~ Dmnl
~ The relative strengths of ODS interest groups to one another. A value of 0 \
indicates that regulation opposition groups have complete influence. A \
value of 1 indicates that pro-regulation groups have complete influence. \
The RAMP describes the increase of pro-regulation interest group influence \
between 1975-1985. This formulation is based on Kingdon's (2003) political \
stream.
|

indicated political willingness to adjust ODS emissions policy=
Society's perception of percent increased skin cancer risks due to ozone depletion*politician's sensitivity to society's risk perception
*"amount of pro-ODS regulation influence"*politicians sensitivity to interest groups\
*politician's sensitivity to ODS replacement technology availability
*"% of ODS replacement technology puzzles solved"
~ Dmnl
~ The indicated politicial willingness for adjusting ODS regulations. A \
value of 0 indicates no willingness to adjust regulations. A value of 1 \
indicates complete willingness to adjust regulations. A value greater then \
1 indicates a "over willingness" to adjust regulations. This formulation \
is based on Kingdon's (2003) political stream.
|

increase in yearly methyl bromide emissions=
(IF THEN ELSE(Time < 1965, 0 , desired annual industry growth in methyl bromide emissions
))*methyl bromide political willingness switch
~ thousand tons/Year/Year
~ The industry desired yearly MBr emissions. The IF THEN statement allows \
the model to begin emitting MBr at the time it became commerically \

produced. The political willingness switch stops emission grow once
policy \
makers deicde to regulate emissions
|

increase of policy maker attention to ozone reated cancer risks due to scientific
knowledge\
=
scientists' estimation of the percent increased skin cancer risk from stratospheric
ozone depletion\
*sensitivity of policy maker attention to atmospheric science knowledge
~ hours/Year
~ The increase in policy maker attention to ozone related cancer risks due \
to atmospheric science knowledge. This formulation is based on
Kingdon's \
(2003) problem stream.
|

"HCFC-22 political willingness switch"=
IF THEN ELSE(Political willingness to adjust ODS emission policy<"min
political willingness to restrict HCFC-22 emissions"\
, 1 , 0)
~ Dmnl
~ The IF THEN statement is used to determine if the current political \
willingness exceeds the required minimum political willingness to \
regulate. 1 indicates that the current political willingness is less then \
the minimum political willingness to regulate. 0 indicates that the \
current political willingness is greater then the minimum political \
willingness to regulate.
|

Annual anthropogenic methyl bromide emission rate= INTEG (
increase in yearly methyl bromide emissions-decrease in yearly methyl bromide
emissions\
,
0)
~ thousand tons/Year
~ Describes the annual yearly emissions of MBr. The annual MBr emission
rate \
is determined by the annual growth in yearly emissions and the decision to
\
regulate.
|

methyl bromide emissions=

Annual anthropogenic methyl bromide emission rate*methyl bromide molecules per thousand ton
~ trillion molecules/Year
~ The annual MBr emission rate is determined by the annual growth in yearly \
emissions and the decision to regulate. Mutliplying by the number of MBr \
molecules per thousand tonnes converts the emissions to trillion molecules.
|

"increase yearly HCFC-22 emissions"=
(IF THEN ELSE(Time < 1955, 0 , "desired annual industry growth in HCFC-22 emissions"\
))*"HCFC-22 political willingness switch"
~ thousand tons/Year/Year
~ The industry desired yearly HCFC-22 emissions. The IF THEN statement \
allows the model to begin emitting HCFC-22 at the time it became \
commerically produced. The political willingness switch stops emission \
grow once policy makers deicde to regulate emissions
|

methyl bromide political willingness switch=
IF THEN ELSE(Political willingness to adjust ODS emission policy<min political willingness to restrict anthropogenic methyl bromide emissions\
, 1 , 0)
~ Dmnl
~ The IF THEN statement is used to determine if the current political \
willingness exceeds the required minimum political willingness to \
regulate. 1 indicates that the current political willingness is less then \
the minimum political willingness to regulate. 0 indicates that the \
current political willingness is greater then the minimum political \
willingness to regulate.
|

decrease in yearly methyl bromide emissions=
(1-methyl bromide political willingness switch)*(annual decrease in anthropogenic methyl bromide emissions\
*Annual anthropogenic methyl bromide emission rate
)/time to reduce emissions
~ thousand tons/(Year*Year)
~ Once the decision to regulate is made the annual MBr emission rate is \
reduced by the percentage reduction in allowable emissions.
|

"HCFC-22 emissions"=

"Annual HCFC-22 emission rate"*"HCFC-22 molecules per thousand ton"
~ trillion molecules/Year
~ The annual HCFC-22 emission rate is determined by the annual growth in
\
yearly emissions and the decision to regulate. Mutliplying by the number \
of HCFC-22 molecules per thousand tonnes converts the emissions to \
trillion molecules.
|

"decrease yearly HCFC-22 emissions"=
(1-"HCFC-22 political willingness switch")*("Annual HCFC-22 emission
rate"*"annual decrease in HCFC-22 emissions"\
)/time to reduce emissions
~ thousand tons/(Year*Year)
~ Once the decision to regulate is made the annual HCFC-22 emission rate
is \
reduced by the percentage reduction in allowable emissions.
|

"Annual HCFC-22 emission rate"= INTEG (
"increase yearly HCFC-22 emissions"-"decrease yearly HCFC-22 emissions",
0)
~ thousand tons/Year
~ Describes the annual yearly emissions of HCFC-22. The annual HCFC-22
\
emission rate is determined by the annual growth in yearly emissions and \
the decision to regulate.
|

increase in yearly CCl4 emissions=
(IF THEN ELSE(Time = 1921, 9 , Annual CCl4 emission rate*desired annual
industry growth in CCl4 emissions\
))*CCl4 political willingness switch
~ thousand tons/Year/Year
~ The industry desired yearly CCl4 emissions. The IF THEN statement
allows \
the model to begin emitting CCl4 at the time it became commerically \
produced. The political willingness switch stops emission grow once
policy \
makers deicde to regulate emissions
|

increase in yearly CH3CCl3 emissions=
(IF THEN ELSE(Time < 1955, 0 , desired annual industry growth in CH3CCl3
emissions))\
*CH3CCl3 political willingness switch

~ thousand tons/Year/Year
~ The industry desired yearly CH3CCl3 emissions. The IF THEN statement \
allows the model to begin emitting CH3CCl3 at the time it became \
commerically produced. The political willingness switch stops emission \
grow once policy makers deicde to regulate emissions
|

"halon-1211 emissions"=
"Annual halon-1211 emission rate"*"halon-1211 molecules per thousand ton"
~ trillion molecules/Year
~ The annual Halon-1211 emission rate is determined by the annual growth in \
yearly emissions and the decision to regulate. Mutliplying by the number \
of Halon-1211 molecules per thousand tonnes converts the emissions to \
trillion molecules.
|

"increase in yearly halon-1301 emissions"=
(IF THEN ELSE(Time = 1963, 0.004 , "Annual halon-1301 emission rate"*"desired annual industry growth in halon-1301 emissions"
))*"halon-1301 political willingness switch"
~ thousand tons/Year/Year
~ The industry desired yearly Halon-1301 emissions. The IF THEN statement \
allows the model to begin emitting Halon-1301 at the time it became \
commerically produced. The political willingness switch stops emission \
grow once policy makers deicde to regulate emissions
|

"CFC-113 political willingness switch"=
IF THEN ELSE(Political willingness to adjust ODS emission policy<"min political willingness to restrict CFC-113 emissions"\
, 1 , 0)
~ Dmnl
~ The IF THEN statement is used to determine if the current political \
willingness exceeds the required minimum political willingness to \
regulate. 1 indicates that the current political willingness is less then \
the minimum political willingness to regulate. 0 indicates that the \
current political willingness is greater then the minimum political \
willingness to regulate.
|

"decrease in annual CFC-113 emissions"=
(1-"CFC-113 political willingness switch")*("annual decrease in CFC-113 emissions"*"Annual CFC-113 emission rate"\

)/time to reduce emissions
~ thousand tons/(Year*Year)
~ Once the decision to regulate is made the annual CFC-113 emission rate is \
reduced by the percentage reduction in allowable emissions.
|

"halon-1211 political willingness switch"=
IF THEN ELSE(Political willingness to adjust ODS emission policy<"min political willingness to restrict halon-1211 emissions"\
, 1 , 0)
~ Dmnl
~ The IF THEN statement is used to determine if the current political \
willingness exceeds the required minimum political willingness to \
regulate. 1 indicates that the current political willingness is less then \
the minimum political willingness to regulate. 0 indicates that the \
current political willingness is greater then the minimum political \
willingness to regulate.
|

CCl4 emissions=
Annual CCl4 emission rate*CCl4 molecules per thousand tons
~ trillion molecules/Year
~ The annual CCl4 emission rate is determined by the annual growth in yearly \
emissions and the decision to regulate. Mutliplying by the number of CCl4 \
molecules per thousand tonnes converts the emissions to trillion molecules.
|

"decrease in yearly halon-1301"=
(1-"halon-1301 political willingness switch")*("Annual halon-1301 emission rate"*"annual decrease in halon-1301 emissions"\
)/time to reduce emissions
~ thousand tons/(Year*Year)
~ Once the decision to regulate is made the annual Halon-1301 emission rate \
is reduced by the percentage reduction in allowable emissions.
|

"halon-1301 emissions"=
"Annual halon-1301 emission rate"*"halon-1301 molecules per thousand ton"
~ trillion molecules/Year
~ The annual Halon-1301 emission rate is determined by the annual growth in \
yearly emissions and the decision to regulate. Mutliplying by the number \

of Halon-1301 molecules per thousand tonnes converts the emissions to \
trillion molecules.
|

"decrease yearly halon-1211 emission rate"=
(1-"halon-1211 political willingness switch")*("annual decrease in halon-1211 emissions"\
*"Annual halon-1211 emission rate")/time to reduce emissions
~ thousand tons/(Year*Year)
~ Once the decision to regulate is made the annual Halon-1211 emission rate \
is reduced by the percentage reduction in allowable emissions.
|

CCl4 political willingness switch=
IF THEN ELSE(Political willingness to adjust ODS emission policy<min political willingness to restrict CCl4 emissions\
, 1 , 0)
~ Dmnl
~ The IF THEN statement is used to determine if the current political \
willingness exceeds the required minimum political willingness to \
regulate. 1 indicates that the current political willingness is less then \
the minimum political willingness to regulate. 0 indicates that the \
current political willingness is greater then the minimum political \
willingness to regulate.
|

decrease in yearly CH3CCl3 emissions=
(1-CH3CCl3 political willingness switch)*(Annual CH3CCl3 emission rate*annual decrease in CH3CCl3 emissions\
)/time to reduce emissions
~ thousand tons/(Year*Year)
~ Once the decision to regulate is made the annual CH3CCl4 emission rate is \
reduced by the percentage reduction in allowable emissions.
|

"halon-1301 political willingness switch"=
IF THEN ELSE(Political willingness to adjust ODS emission policy<"min political willingness to restrict halon-1301 emissions"\
, 1 , 0)
~ Dmnl
~ The IF THEN statement is used to determine if the current political \
willingness exceeds the required minimum political willingness to \
regulate. 1 indicates that the current political willingness is less then \
the minimum political willingness to regulate. 0 indicates that the \

current political willingness is greater then the minimum political \
willingness to regulate.
|

"Annual halon-1211 emission rate"= INTEG (
"increase yearly halon-1211 emission rate"-"decrease yearly halon-1211 emission rate"\
,
0)
~ thousand tons/Year
~ Describes the annual yearly emissions of Halon-1211. The annual Halon-1211 \
emission rate is determined by the annual growth in yearly emissions and \
the decision to regulate.
|

Annual CH3CCl3 emission rate= INTEG (
increase in yearly CH3CCl3 emissions-decrease in yearly CH3CCl3 emissions,
0)
~ thousand tons/Year
~ Describes the annual yearly emissions of CH3CCl4. The annual CH3CCl4 \
emission rate is determined by the annual growth in yearly emissions and \
the decision to regulate.
|

decrease in yearly CCl4 emissions=
(1-CCl4 political willingness switch)*(Annual CCl4 emission rate*annual decrease in CCl4 emissions\
)/time to reduce emissions
~ thousand tons/(Year*Year)
~ Once the decision to regulate is made the annual CCl4 emission rate is \
reduced by the percentage reduction in allowable emissions.
|

"Annual halon-1301 emission rate"= INTEG (
"increase in yearly halon-1301 emissions"-"decrease in yearly halon-1301",
0)
~ thousand tons/Year
~ Describes the annual yearly emissions of Halon-1301. The annual Halon-1301 \
emission rate is determined by the annual growth in yearly emissions and \
the decision to regulate.
|

"increase yearly halon-1211 emission rate"=

```
	(IF THEN ELSE(Time = 1963, 0.03 , "Annual halon-1211 emission 
rate"*"desired annual industry growth in halon-1211 emissions"
	))*"halon-1211 political willingness switch"
	~	thousand tons/Year/Year
	~	The industry desired yearly Halon-1211 emissions. The IF THEN 
statement \
		allows the model to begin emitting Halon-1211 at the time it became \
		commerically produced. The political willingness switch stops emission \
		grow once policy makers deicde to regulate emissions
	|

CH3CCl3 political willingness switch=
	IF THEN ELSE(Political willingness to adjust ODS emission policy<min 
political willingness to restrict CH3CCl3 emissions\
		, 1 , 0)
	~	Dmnl
	~	The IF THEN statement is used to determine if the current political \
		willingness exceeds the required minimum political willingness to \
		regulate. 1 indicates that the current political willingness is less then \
		the minimum political willingness to regulate. 0 indicates that the \
		current political willingness is greater then the minimum political \
		willingness to regulate.
	|

CH3CCl3 emissions=
	Annual CH3CCl3 emission rate*CH3CCl3 molecules per thousand ton
	~	trillion molecules/Year
	~	The annual CH3CCl4 emission rate is determined by the annual growth in 
\
		yearly emissions and the decision to regulate. Mutliplying by the number \
		of CH3CCl4 molecules per thousand tonnes converts the emissions to \
		trillion molecules.
	|

"CFC-113 emissions"=
	"Annual CFC-113 emission rate"*"CFC-113 molecules per thousand ton"
	~	trillion molecules/Year
	~	The annual CFC 113 emission rate is determined by the annual growth in \
		yearly emissions and the decision to regulate. Mutliplying by the number \
		of CFC-113 molecules per thousand tonnes converts the emissions to \
		trillion molecules.
	|

Annual CCl4 emission rate= INTEG (
	increase in yearly CCl4 emissions-decrease in yearly CCl4 emissions,
		0)
```

~ thousand tons/Year
~ Describes the annual yearly emissions of CCl4. The annual CCl4 emission \
rate is determined by the annual growth in yearly emissions and the \
decision to regulate.
|

"increase in yearly CRC-113 emissions"=
(IF THEN ELSE(Time = 1944, 0.4 , "Annual CFC-113 emission rate"*"desired annual industry growth in CFC-113 emissions"
))*"CFC-113 political willingness switch"
~ thousand tons/Year/Year
~ The industry desired yearly CFC-113 emissions. The IF THEN statement \
allows the model to begin emitting CFC-113 at the time it became \
commerically produced. The political willingness switch stops emission \
grow once policy makers deicde to regulate emissions
|

"Annual CFC-113 emission rate"= INTEG (
"increase in yearly CRC-113 emissions"-"decrease in annual CFC-113 emissions",
0)
~ thousand tons/Year
~ Describes the annual yearly emissions of CFC-113. The annual CFC 113 \
emission rate is determined by the annual growth in yearly emissions and \
the decision to regulate.
|

"annual growth in yearly CFC-11 emissions"=
(IF THEN ELSE(Time=1939, 0.5 , "Annual CFC-11 emission rate"*"desired annual industry growth in CFC-11 emissions"
))*"CFC-11 political willingness switch"
~ thousand tons/Year/Year
~ The industry desired yearly CFC-11 emissions. The IF THEN statement allows \
the model to begin emitting CFC-11 at the time it became commerically \
produced. The political willingness switch stops emission grow once policy \
makers deicde to regulate emissions
|

"annual growth in yearly CFC-12 emissions"=
(IF THEN ELSE(Time = 1931, 0.1 , "Annual CFC-12 emission rate"*"desired annual industry growth in CFC-12 emissions"
))*"CFC-12 political willingness switch"
~ thousand tons/Year/Year

~ The industry desired yearly CFC-12 emissions. The IF THEN statement allows \
the model to begin emitting CFC-12 at the time it became commerically \
produced. The political willingness switch stops emission grow once policy \
makers deicde to regulate emissions
|

time to reduce emissions=
1
~ Year
~ The time over which annual emissions are reduced is 1 year.
|

"annual decrease in CFC-11 emissions"=
(1-"CFC-11 political willingness switch")*("Annual CFC-11 emission rate"*"annual percent of allowed CFC-11 baseline emissions"\
)/time to reduce emissions
~ thousand tons/(Year*Year)
~ Once the decision to regulate is made the annual CFC-11 emission rate is \
reduced by the percentage reduction in allowable emissions.
|

"Annual CFC-12 emission rate"= INTEG (
"annual growth in yearly CFC-12 emissions"-"annual decrease in yearly CFC-12 emissions"\
,
0)
~ thousand tons/Year
~ Describes the annual yearly emissions of CFC-12. The annual CFC 12 \
emission rate is determined by the annual growth in yearly emissions and \
the decision to regulate.
|

"CFC-11 emissions"=
"Annual CFC-11 emission rate"*"CFC-11 molecules per thousand ton"
~ trillion molecules/Year
~ The annual CFC 11 emission rate is determined by the annual growth in \
yearly emissions and the decision to regulate. Mutliplying by the number \
of CFC-11 molecules per thousand tonnes converts the emissions to trillion \
molecules.
|

"CFC-12 political willingness switch"=

IF THEN ELSE(Political willingness to adjust ODS emission policy<"min political willingness to restrict CFC-12 emissions"\
, 1 , 0)
~ Dmnl
~ The IF THEN statement is used to determine if the current political \
willingness exceeds the required minimum political willingness to \
regulate. 1 indicates that the current political willingness is less then \
the minimum political willingness to regulate. 0 indicates that the \
current political willingness is greater then the minimum political \
willingness to regulate.
|

"annual CFC-12 emissions (molecules)"=
"Annual CFC-12 emission rate"*"CFC-12 molecules per thousand tons"
~ trillion molecules/Year
~ The annual CFC 12 emission rate is determined by the annual growth in \
yearly emissions and the decision to regulate. Mutliplying by the number \
of CFC-12 molecules per thousand tonnes converts the emissions to trillion \
molecules.
|

"annual decrease in yearly CFC-12 emissions"=
(1-"CFC-12 political willingness switch")*("annual decrease in CFC-12 emissions"*"Annual CFC-12 emission rate"\
)/time to reduce emissions
~ thousand tons/(Year*Year)
~ Once the decision to regulate is made the annual CFC-12 emission rate is \
reduced by the percentage reduction in allowable emissions.
|

"CFC-11 political willingness switch"=
IF THEN ELSE(Political willingness to adjust ODS emission policy<"min political willingness to restrict CFC-11 emissions"\
, 1 , 0)
~ Dmnl
~ The IF THEN statement is used to determine if the current political \
willingness exceeds the required minimum political willingness to \
regulate. 1 indicates that the current political willingness is less then \
the minimum political willingness to regulate. 0 indicates that the \
current political willingness is greater then the minimum political \
willingness to regulate.
|

"Annual CFC-11 emission rate"= INTEG (

"annual growth in yearly CFC-11 emissions"-"annual decrease in CFC-11 emissions",
0)
~ thousand tons/Year
~ Describes the annual yearly emissions of CFC-11. The annual CFC 11 \
emission rate is determined by the annual growth in yearly emissions and \
the decision to regulate.
|

anthropogenic stratospheric ozone destruction rate=
MIN(amount of stratospheric ozone that can be destroyed by available anthropogenic Cl and Br\
/min time to destroy ozone,("Total stratospheric ozone (actual)"/min time to destroy ozone\
)+production of stratospheric ozone)
~ trillion molecules/Year
~ Anthropogenic destruction of stratospheric ozone is determined by the \
number of ozone molecules that can be detroyed by Cl and Br in the \
stratosphere. The MIN function prevents the anthropogenic descstruction \
from exceeding the existing the sum of the existing ozone and the ozone \
being being produced.
|

destruction of stratospheric ozone=
anthropogenic stratospheric ozone destruction rate+natural anthropogenic stratospheric ozone destruction rate
~ trillion molecules/Year
~ Stratospheric ozone destruction is the sume of natural destruction \
processes and anthropogenic destruction processes.
|

time to develop atmospheric science knowledge=
MAX(average time required to develop atmospheric science knowledge*(1-"% change in global total stratospheric ozone from baseline value (absolute)"\
),0.1)
~ Year
~ The time required to develop atmospheric science knowledge is increased by \
an increased change in the amount of stratospheric ozone. This reflects \
scientist being more aware of and concerned with the problem so they make \
more effort to solve. The MAX function prevents the model from coming \
unstable when % change in global total stratospheric ozone approaches 1.
|

average time required to develop atmospheric science knowledge=

5
~ Year
~ The average time required to develop scientific knowledge on a generic \
topic.
|

"stratospheric concentration of CFC-11"=
"CFC-11 in the stratosphere"*coversion factor to ppt
~ ppt
~ |

coversion factor to ppt=
5.31e-032
~ ppt/trillion molecules
~ |

production of stratospheric ozone=
natural production rate of stratospheric ozone
~ trillion molecules/Year
~ The natural production rate of stratospheric ozone.
|

natural anthropogenic stratospheric ozone destruction rate=
natural ozone destruction rate constant*"Total stratospheric ozone (actual)"
~ trillion molecules/Year
~ Stratospheric ozone is destroyed naturally based on the natural \
desctruction rate constant and the amount of available ozone. This \
assumption is consistent with stratospheric chemistry
|

natural ozone destruction rate constant=
natural production rate of stratospheric ozone/average initial steady state stratospheric ozone
~ 1/Year
~ The rate constant assumes that at steady state and with no anthropogenic \
ozone destruction the ozone production rate = ozone destruction rate. \
Therefore, the rate constant is the assumed natural production \
rate/initial average ozone level. This formulation does not include \
natural variations in ozone production and destruction.
|

natural production rate of stratospheric ozone=
1.62e+026
~ trillion molecules/Year
~ The yearly natural production of stratospheric ozone. The number is \
calculated based upon the volume of the ozone layer and the estimated \

yearly production of ozone in the stratosphere at an altitude of 25km from \
Figure 3.5 from Dressler "The chemistry and physics of stratospheric \
ozone."
|

policy maker's perceived economic risk of regulation=
1
~ hour/hour
~ Describes the increase in policy maker attention to economic risks based \
on increased attention to environmental risks. A value of 1 adds 1 hour of \
attention to economic risks for every hour added to environmental risks. A \
value less then indicates a greater concern for environmental risks. A \
value greater then 1 indicates a greater concern for economic risks. This \
formulation is based on Kingdon's (2003) problem stream.
|

increase annual policy maker attention to ODS regulation risks=
MIN((increase policy maker annual attention to ozone related cancer concerns*policy maker's perceived economic risk of regulation\
*(1-"% of ODS replacement technology puzzles solved"
)), (maximum annual policy maker attention to ODS regulation economic risks
-Annual attention of policy makers to economic risks of ODS regulation)/time required to raise policy maker attention to maximum level
)
~ hours/(Year*Year)
~ Policy maker attention to economic problems associated with stratospheric \
ozone depletion increases as policy makers pay attention to stratospheric \
ozone depletion. As available technology increases, policy makers \
attention to economic risks decrease. The MIN function ensures that total \
attention to economic risks does not exceed the maximum allowabe value.
|

"CH3CCl3 atmospheric concentration (actual)":=
GET XLS DATA('Real system data.xls', 'CH3CCl3 Production', 'A', 'G87')
~ ppt
~ Data from Figure 16.1 in Fahey, D. 2006. "Twenty questions and answers \
about the ozone layer: 2006 update." Panel Review Meeting for the 2006 \
Ozone Assessment. Les Diablerets, Switzerland, June 19-23.
|

"CFC-12 atmospheric concentration (actual)":=
GET XLS DATA('Real system data.xls', 'CFC-12 Emission', 'A', 'C85')

```
	~	ppt
	~	Data from Figure 16.1 in Fahey, D. 2006. "Twenty questions and answers \
		about the ozone layer: 2006 update." Panel Review Meeting for the 2006 \
		Ozone Assessment. Les Diablerets, Switzerland, June 19-23.
	|

"HCFC-22 atmospheric concentration (actual)":=
	GET XLS DATA('Real system data.xls', 'HCFC-22 Emission', 'A', 'E100')
	~	ppt
	~	Data from Figure 16.1 in Fahey, D. 2006. "Twenty questions and answers \
		about the ozone layer: 2006 update." Panel Review Meeting for the 2006 \
		Ozone Assessment. Les Diablerets, Switzerland, June 19-23.
	|

"Halon-1211 atmospheric concentration (actual)":=
	GET XLS DATA('Real system data.xls', 'Halon-1211 Emission', 'A', 'E100')
	~	ppt
	~	Data from Figure 16.1 in Fahey, D. 2006. "Twenty questions and answers \
		about the ozone layer: 2006 update." Panel Review Meeting for the 2006 \
		Ozone Assessment. Les Diablerets, Switzerland, June 19-23.
	|

"CFC-113 atmospheric concentration (actual)":=
	GET XLS DATA('Real system data.xls', 'CFC-113 Emission', 'A', 'C91')
	~	ppt
	~	Data from Figure 16.1 in Fahey, D. 2006. "Twenty questions and answers \
		about the ozone layer: 2006 update." Panel Review Meeting for the 2006 \
		Ozone Assessment. Les Diablerets, Switzerland, June 19-23.
	|

"CFC-11 atmospheric concentration (actual)":=
	GET XLS DATA('Real system data.xls', 'CFC-11 Emission', 'A', 'C85')
	~	ppt
	~	Data from Figure 16.1 in Fahey, D. 2006. "Twenty questions and answers \
		about the ozone layer: 2006 update." Panel Review Meeting for the 2006 \
		Ozone Assessment. Les Diablerets, Switzerland, June 19-23.
	|

"Halon-1301 atmospheric concentration (actual)":=
	GET XLS DATA('Real system data.xls', 'Halon-1301 Emission', 'A', 'E98')
	~	ppt
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```
	~	Data from Figure 16.1 in Fahey, D. 2006. "Twenty questions and answers \
		about the ozone layer: 2006 update." Panel Review Meeting for the 2006 \
		Ozone Assessment. Les Diablerets, Switzerland, June 19-23.
	|

"CCl4 atmospheric concentration (actual)":=
	GET XLS DATA('Real system data.xls', 'CCl4 Production', 'A', 'G87')
	~	ppt
	~	Data from Figure 16.1 in Fahey, D. 2006. "Twenty questions and answers \
		about the ozone layer: 2006 update." Panel Review Meeting for the 2006 \
		Ozone Assessment. Les Diablerets, Switzerland, June 19-23.
	|

Reactive Cl in the stratosphere=
	Reactive Cl in the stratosphere due to CCl4+"Reactive Cl in the stratosphere due to CFC-11"\
		+"Reactive Cl in the stratosphere due to CFC-113"+"Reactive Cl in the stratosphere due to CFC-12"\
		+Reactive Cl in the stratosphere due to CH3CCl3+"Reactive Cl in the stratosphere due to halon-1211"\
		+"Reactive Cl in the stratosphere due to HCFC-22"
	~	trillion atoms
	~	The total amount of reactive Cl in the stratosphere due to anthropogenic \
		sources.
	|

"stratospheric Cl concentration (actual)":=
	GET XLS DATA('Real system data.xls', 'CL concentration', 'A', 'C9')
	~	ppb
	~	EPA data from "Environmental Indicators: Ozone Depletion" available at \
		http://www.epa.gov/ozone/science/indicat/techsupp.html
	|

"annual CH3CCl3 emission restrictions (actual)":=
	GET XLS DATA('Real system data.xls', 'Emission Restrictions', 'A', 'K15')
	~	thousand tons/Year
	~	Data from United Nations Environmental Programme (UNEP). 2005. Production \
		and consumption of ozone depleting substances under the Montreal Protocol. \
		Available at http://www.unep.org/ozone. Accessed June 18, 2008.
	|

"annual CFC-11 emission restrictions (actual)":=
```

```
	GET XLS DATA('Real system data.xls', 'Emission Restrictions', 'A', 'C11')
	~	thousand tons/Year
	~	Data from United Nations Environmental Programme (UNEP). 2005. 
Production \
		and consumption of ozone depleting substances under the Montreal 
Protocol. \
		Available at http://www.unep.org/ozone. Accessed June 18, 2008.
	|

"annual Halon-1211 emission restrictions (actual)":=
	GET XLS DATA('Real system data.xls', 'Emission Restrictions', 'A', 'O14')
	~	thousand tons/Year
	~	Data from United Nations Environmental Programme (UNEP). 2005. 
Production \
		and consumption of ozone depleting substances under the Montreal 
Protocol. \
		Available at http://www.unep.org/ozone. Accessed June 18, 2008.
	|

"annual HCFC-22 emission restrictions (actual)":=
	GET XLS DATA('Real system data.xls', 'Emission Restrictions', 'A', 'S18')
	~	thousand tons/Year
	~	Data from United Nations Environmental Programme (UNEP). 2005. 
Production \
		and consumption of ozone depleting substances under the Montreal 
Protocol. \
		Available at http://www.unep.org/ozone. Accessed June 18, 2008.
	|

"annual CFC-113 emission restrictions (actual)":=
	GET XLS DATA('Real system data.xls', 'Emission Restrictions', 'A', 'G11')
	~	thousand tons/Year
	~	Data from United Nations Environmental Programme (UNEP). 2005. 
Production \
		and consumption of ozone depleting substances under the Montreal 
Protocol. \
		Available at http://www.unep.org/ozone. Accessed June 18, 2008.
	|

"annual Halon-1301 emission restrictions (actual)":=
	GET XLS DATA('Real system data.xls', 'Emission Restrictions', 'A', 'M14')
	~	thousand tons/Year
	~	Data from United Nations Environmental Programme (UNEP). 2005. 
Production \
		and consumption of ozone depleting substances under the Montreal 
Protocol. \
```

```
		Available at http://www.unep.org/ozone. Accessed June 18, 2008.
	|

"annual CCl4 emission restrictions (actual)":=
	GET XLS DATA('Real system data.xls', 'Emission Restrictions', 'A', 'I17')
	~	thousand tons/Year
	~	Data from United Nations Environmental Programme (UNEP). 2005. 
Production \
		and consumption of ozone depleting substances under the Montreal 
Protocol. \
		Available at http://www.unep.org/ozone. Accessed June 18, 2008.
	|

"annual CFC-12 emission restrictions (actual)":=
	GET XLS DATA('Real system data.xls', 'Emission Restrictions', 'A', 'E11')
	~	thousand tons/Year
	~	Data from United Nations Environmental Programme (UNEP). 2005. 
Production \
		and consumption of ozone depleting substances under the Montreal 
Protocol. \
		Available at http://www.unep.org/ozone. Accessed June 18, 2008.
	|

"Annual anthropogenic methyl bromide emission restrictions (actual)":=
	GET XLS DATA('Real system data.xls', 'Emission Restrictions', 'A', 'Q17')
	~	thousand tons/Year
	~	Data from United Nations Environmental Programme (UNEP). 2005. 
Production \
		and consumption of ozone depleting substances under the Montreal 
Protocol. \
		Available at http://www.unep.org/ozone. Accessed June 18, 2008.
	|

politician's sensitivity to society's risk perception=
	50
	~	Dmnl
	~	Politicians sensitivity to society's risk perception represents how much \
		an increase in soceity's risk perception increases politicians willingness \
		to adjust ODS emissions standards. A value of 1 indicates that political \
		willingness is in direct proportion to society's risk perception. A value \
		less then 1 attenuates risk perception. A value greater then 1 amplifies \
		risk perception. This formulation is based on Kingdon's (2003) political \
		stream.
	|

politician's sensitivity to ODS replacement technology availability=
```

1
~ Dmnl
~ Politicians sensitivity to society's risk perception represents how much \
an increase in soceity's risk perception increases politicians willingness \
to adjust ODS emissions standards. A value of 1 indicates that political \
willingness is in direct proportion to society's risk perception. A value \
less then 1 attenuates risk perception. A value greater then 1 amplifies \
risk perception. This formulation is based on Kingdon's (2003) political \
stream.
|

development of atmospheric science knowledge=
("% of atmospheric science puzzles solved per dollar of funding"*funding for atmospheric science research\
*Unresolved ozone related atmospheric science puzzles
)/time to develop atmospheric science knowledge
~ puzzles/Year
~ The development of atmosphere science knowledge decreases the number of \
number of science puzzles left to be solved. This formulation is based on \
Sterman's (1985) model of Kuhn's theory of knowledge development.
|

"annual anthropogenic methyl bromide emission rate (actual)":=
GET XLS DATA('Real system data.xls', 'Methyl Bromide Emission', 'A', 'B91')
~ thousand tons/Year
~ Data from Duafla, T. and Gillis, M. "Properties, applications, and \
emissions of man-made methyl bromide." The handbook of environmental \
chemistry. 1999 Chapter 7. Years 1989-2000 from 1989-2000 UNEP "Production \
and consumption of ozone depleting substances under the Montreal Protocol"
|

"Reactive Br in the stratosphere due to halon-1301"= INTEG (
-"removal of Br produced from halon-1301 from the stratosphere"+"release of Br from halon-1301 conversion"\
,
0)
~ trillion atoms
~ The number of reactive chlorine molecules in the stratosphere due to the \
chemcial conversion of Halon-1301.
|

Reactive Br in the stratosphere due to anthropogenic methyl bromide= INTEG (

-removal of Br produced from anthropogenic methyl bromide from the stratosphere+release of Br from anthropogenic methyl bormide conversion\
,
0)
~ trillion atoms
~ The number of reactive chlorine molecules in the stratosphere due to the \
chemcial conversion of MBr.
|

Reactive Cl in the stratosphere due to CCl4= INTEG (
-removal of Cl produced from CCl4 from the stratosphere+release of Cl from CCl4 conversion\
,
0)
~ trillion atoms
~ The number of reactive chlorine molecules in the stratosphere due to the \
chemcial conversion of CCl4.
|

"Reactive Cl in the stratosphere due to CFC-11"= INTEG (
-"removal of Cl produced from CFC-11 from the stratosphere"+"release of Cl from CFC-11 conversion"\
,
0)
~ trillion atoms
~ The number of reactive chlorine molecules in the stratosphere due to the \
chemcial conversion of CFC-11.
|

"Reactive Cl in the stratosphere due to CFC-113"= INTEG (
-"removal of Cl produced from CFC-113 from the stratosphere"+"release of Cl from CFC-113 conversion"\
,
0)
~ trillion atoms
~ The number of reactive chlorine molecules in the stratosphere due to the \
chemcial conversion of CFC-113.
|

"Reactive Cl in the stratosphere due to CFC-12"= INTEG (
-"removal of Cl produced from CFC-12 from the stratosphere"+"release of Cl from CFC-12 conversion"\
,
0)
~ trillion atoms
~ The number of reactive chlorine molecules in the stratosphere due to the \

chemcial conversion of CFC-12.
|

Reactive Cl in the stratosphere due to CH3CCl3= INTEG (
-removal of Cl produced from CH3CCl3 from the stratosphere+release of Cl from CH3CCl3 conversion\
,
0)
~ trillion atoms
~ The number of reactive chlorine molecules in the stratosphere due to the \
chemcial conversion of CH3CCl3.
|

release of Cl from CH3CCl3 conversion=
number of Cl atoms in one molecule of CH3CCl3*chemical conversion of CH3CCl3
~ trillion atoms/Year
~ The release of Cl atoms from CH3CCl3 chemical breakdown in the \
stratosphere.
|

"Reactive Cl in the stratosphere due to HCFC-22"= INTEG (
-"removal of Cl produced from HCFC-22 from the stratosphere"+"release of Cl from HCFC-22 conversion"\
,
0)
~ trillion atoms
~ The number of reactive chlorine molecules in the stratosphere due to the \
chemcial conversion of HCFC-22.
|

"release of Cl from HCFC-22 conversion"=
"number of Cl atoms in one molecule of HCFC-22"*"reaction of HCFC-22 to form Cl"
~ trillion atoms/Year
~ The release of Cl atoms from HCFC-22 chemical breakdown in the \
stratosphere.
|

"release of Br from halon-1211 conversion"=
"chemical conversion of halon-1211"*"number of Br atoms in one molecule of halon-1211"
~ trillion atoms/Year
~ There is one Br and one Cl atom in each molecule of halon-1211 (CF2BrCl). \
As halon-1211 reactes in the stratosphere it releases one Br and one Cl \

atom. The the reactive rates are equal.
|

"release of Br from halon-1301 conversion"=
"number of Br atoms in one molecule of halon-1301"*"chemical conversion of halon-1301"
~ trillion atoms/Year
~ The release of Br atoms from Halon-1301 chemical breakdown in the \
stratosphere.
|

release of Br from anthropogenic methyl bormide conversion=
chemical conversion of anthropogenic methyl bromide*number of Br atoms in one molecule of methyl bromide
~ trillion atoms/Year
~ The release of Br atoms from MBr chemical breakdown in the stratosphere.
|

"CFC-11 in the stratosphere"= INTEG (
+"transport of CFC-11 to the stratosphere"-"chemical conversion of CFC-11",
0)
~ trillion molecules
~ The number of molecults of CFC-11 in the stratosphere. Increases with an \
increased transport of CFC-11 from the troposphere and decreases as CFC-11 \
reacts and is converted to Cl and other particles.
|

"release of Cl from CFC-11 conversion"=
"chemical conversion of CFC-11"*"number of Cl atoms in one molecule of CFC-11"
~ trillion atoms/Year
~ The release of Cl atoms from CFC-11 chemical breakdown in the stratosphere.
|

"release of Cl from CFC-113 conversion"=
"number of Cl atoms in one molecule of CFC-113"*"chemical conversion of CFC-113"
~ trillion atoms/Year
~ The release of Cl atoms from CFC-113 chemical breakdown in the \
stratosphere.
|

"release of Cl from CFC-12 conversion"=
"chemical conversion of CFC-12"*"number of Cl atoms in one molecule of CFC-12"
~ trillion atoms/Year
~ The release of Cl atoms from CFC-12 chemical breakdown in the stratosphere.
|

chemical conversion of CH3CCl3=
CH3CCl3 in the stratosphere/CH3CCl3 atmospheric lifetime
~ trillion molecules/Year
~ The chemical conversion of CH3CCl3 into a reactive ozone depleting gas. \
The conversion to reactive gases takes place over the atmospheric lifetime \
of CH3CCl3.
|

"release of Cl from halon-1211 conversion"=
"chemical conversion of halon-1211"*"number of Cl atoms in one molecule of halon-1211"
~ trillion atoms/Year
~ There is one Br and one Cl atom in each molecule of halon-1211 (CF2BrCl). \
As halon-1211 reactes in the stratosphere it releases one Br and one Cl \
atom. The the reactive rates are equal.
|

"reaction of HCFC-22 to form Cl"=
"HCFC-22 in the stratosphere"/"HCFC-22 atmospheric lifetime"
~ trillion molecules/Year
~ The chemical conversion of HCFC-22 into a reactive ozone depleting gas. \
The conversion to reactive gases takes place over the atmospheric lifetime \
of HCFC-22.
|

chemical conversion of anthropogenic methyl bromide=
Anthropogenic methyl bromide in the stratosphere/methyl bormide atmospheric lifetime
~ trillion molecules/Year
~ The chemical conversion of MBr into a reactive ozone depleting gas. The \
conversion to reactive gases takes place over the atmospheric lifetime of \
MBr.
|

"number of Cl atoms in one molecule of halon-1211"=
1
~ trillion atoms/trillion molecules
~ The number of Cl atoms produced during the chemical conversion of \
Halon-1211. Determined from the molecular formula for halon 1211
(CF2BrCl)
|

chemical conversion of CCl4=
CCl4 in the stratosphere/CCl4 atmospheric lifetime
~ trillion molecules/Year
~ The chemical conversion of CCl4 into a reactive ozone depleting gas. The
\
conversion to reactive gases takes place over the atmospheric lifetime of \
CCl4.
|

"chemical conversion of CFC-11"=
"CFC-11 in the stratosphere"/"CFC-11 atmospheric lifetime"
~ trillion molecules/Year
~ The chemical conversion of CFC-11 into a reactive ozone depleting gas.
The \
conversion to reactive gases takes place over the atmospheric lifetime of \
CFC-11.
|

"chemical conversion of CFC-113"=
"CFC-113 in the stratosphere"/"CFC-113 atmospheric lifetime"
~ trillion molecules/Year
~ The chemical conversion of CFC-113 into a reactive ozone depleting gas. \
The conversion to reactive gases takes place over the atmospheric lifetime
\
of CFC-113.
|

"chemical conversion of CFC-12"=
"CFC-12 in the stratosphere"/"CFC-12 atmospheric lifetime"
~ trillion molecules/Year
~ The chemical conversion of CFC-11 into a reactive ozone depleting gas.
The \
conversion to reactive gases takes place over the atmospheric lifetime of \
CFC-11.
|

"chemical conversion of halon-1301"=

"Halon-1301 in the stratosphere"/"halon-1301 atmospheric lifetime"
~ trillion molecules/Year
~ The chemical conversion of Halon-1301 into a reactive ozone depleting gas. \
The conversion to reactive gases takes place over the atmospheric lifetime \
of Halon-1301.
|

"chemical conversion of halon-1211"=
"Halon-1211 in the stratosphere"/"halon-1211 atmospheric lifetime"
~ trillion molecules/Year
~ The chemical conversion of Halon-1211 into a reactive ozone depleting gas. \
The conversion to reactive gases takes place over the atmospheric lifetime \
of Halon-1211.
|

"Reactive Br in the stratosphere due to halon-1211"= INTEG (
-"removal of Br produced from halon-1211 from the stratosphere"+"release of Br from halon-1211 conversion"\
,
0)
~ trillion atoms
~ The number of reactive bromine molecules in the stratosphere due to the \
chemcial conversion of Halon-1211.
|

release of Cl from CCl4 conversion=
number of Cl atoms in one molecule of CCl4*chemical conversion of CCl4
~ trillion atoms/Year
~ The release of Cl atoms from CCl4 chemical breakdown in the stratosphere.
|

"annual Halon-1211 emission rate (actual)":=
GET XLS DATA('Real system data.xls', 'Halon-1211 Emission' , 'A' , 'C70')
~ thousand tons/Year
~ Estimated emission from MuCulloch, A. 1992. "Global production and \
emission of halon 1211 and 1301." Atmospheric Environment Vol. 26a (7). \
pp. 1325-1329. Data from years 1989-2000 from the UNEP "Production and \
consumption of ozone depleting substances under the Montreal Protocol"
|

```
"Halon-1211 in the stratosphere"= INTEG (
	+"transport of halon-1211 to the stratosphere"-"chemical conversion of halon-
1211",
		0)
	~	trillion molecules
	~	The number of molecults of Halon 1211  in the stratosphere. Increases 
with \
		an increased transport of Halon 1211 from the troposphere and decreases 
as \
		Halon 1211 reacts and is converted to Cl, Br and other particles.
	|

amount of ozone that can be destroyed by Cl from CCl4=
	number of stratospheric ozone molecules destroyed by one Cl atom in a 
year*Reactive Cl in the stratosphere due to CCl4
	~	trillion molecules
	~	The number of stratospheric ozone molecules that can be destoryed by \
		current Cl released from CCl4 present in the stratosphere.
	|

"annual Halon-1301 emission rate (actual)":=
	GET XLS DATA('Real system data.xls', 'Halon-1301 Emission', 'A', 'C70')
	~	thousand tons/Year
	~	Estimated emission from MuCulloch, A. 1992. "Global production and \
		emission of halon 1211 and 1301." Atmospheric Environment Vol. 26a (7). 
\
		pp. 1325-1329. Data from years 1989-2000 from the UNEP "Production 
and \
		consumption of ozone depleting substances under the Montreal Protocol"
	|

"amount of ozone that can be destroyed by Cl from CFC-113"=
	number of stratospheric ozone molecules destroyed by one Cl atom in a 
year*"Reactive Cl in the stratosphere due to CFC-113"
	~	trillion molecules
	~	The number of stratospheric ozone molecules that can be destoryed by \
		current Cl released from CFC-113 present in the stratosphere.
	|

"amount of ozone that can be destroyed by Cl from CFC-12"=
	number of stratospheric ozone molecules destroyed by one Cl atom in a 
year*"Reactive Cl in the stratosphere due to CFC-12"
	~	trillion molecules
	~	The number of stratospheric ozone molecules that can be destoryed by \
		current Cl released from CFC-12 present in the stratosphere.
```

|

"annual CCl4 production rate (actual)":=
GET XLS DATA('Real system data.xls', 'CCl4 Production', 'A', 'E29')
~ thousand tons/Year
~ Doherty, R. 2000. "A history of the production and use of carbon \
tetrachloride, tetrachloroethylene, trichloroethylene and \
1,1,1-trichloroethane in the United States: Part 2" Journal of \
environmental forensics. Issue 1, pp. 83-93. Data from years 1989-2000 \
from the UNEP "Production and consumption of ozone depleting
substances \
under the Montreal Protocol"
|

"amount of ozone that can be destroyed by Cl from HCFC-22"=
number of stratospheric ozone molecules destroyed by one Cl atom in a
year*"Reactive Cl in the stratosphere due to HCFC-22"
~ trillion molecules
~ The number of stratospheric ozone molecules that can be destoryed by \
current Cl released from HCFC-22 present in the stratosphere.
|

amount of stratospheric ozone that can be destroyed by available anthropogenic Cl and
Br\
=
amount of ozone that can be destroyed by Cl from CCl4+"amount of ozone that
can be destroyed by Cl from CFC-11"\
+"amount of ozone that can be destroyed by Cl from CFC-113"
+"amount of ozone that can be destroyed by Cl from CFC-12"+amount of ozone
that can be destroyed by Cl from CH3CCl3\
+"amount of ozone that can be destroyed by Br and Cl from halon-1211"
+"amount of ozone that can be destroyed by Br from halon-1301"+"amount of
ozone that can be destroyed by Cl from HCFC-22"\
+amount of ozone that can be destroyed by Br from anthropogenic methyl
bromide
~ trillion molecules
~ The amount of stratospheric ozone that is destroyed by reactive Cl and Br
\
present in the stratosphere due to anthropogenic sources.
|

"removal of Cl produced from halon-1211 from the stratosphere"=
"Reactive Cl in the stratosphere due to halon-1211"/Cl lifetime
~ trillion atoms/Year
~ The removal of Cl from halon-1211 from the stratosphere based on the \
atmospheric lifetime of Cl.

|

"Reactive Cl in the stratosphere due to halon-1211"= INTEG (
"release of Cl from halon-1211 conversion"-"removal of Cl produced from halon-1211 from the stratosphere"\
,
0)
~ trillion atoms
~ The number of reactive chlorine molecules in the stratosphere due to the \
chemcial conversion of Halon-1211.
|

amount of ozone that can be destroyed by Br from anthropogenic methyl bromide=
effectivness of Br in destroying ozone relative to Cl*number of stratospheric ozone molecules destroyed by one Cl atom in a year\
*Reactive Br in the stratosphere due to anthropogenic methyl bromide
~ trillion molecules
~ The number of stratospheric ozone molecules that can be destoryed by \
current Br released from MBr present in the stratosphere.
|

"number of Br atoms in one molecule of halon-1211"=
1
~ trillion atoms/trillion molecules
~ The number of Br atoms produced during the chemical conversion of \
Halon-1211. Determined from the molecular formula for halon 1211 (CF2BrCl)
|

"number of Br atoms in one molecule of halon-1301"=
1
~ trillion atoms/trillion molecules
~ The number of Br atoms produced during the chemical conversion of \
Halon-1301. Determined from the molecular formula for halon 1301 (CF3Br)
|

number of Br atoms in one molecule of methyl bromide=
1
~ trillion atoms/trillion molecules
~ The number of Br atoms produced during the chemical conversion of MBr. \
Determined from the molecular formula for methyl bromide (CH3Br)
|

number of Cl atoms in one molecule of CCl4=

4
~ trillion atoms/trillion molecules
~ The number of Cl atoms produced during the chemical conversion of
CCl4. \
Determined from the molecular formula for CCl4
|

"number of Cl atoms in one molecule of CFC-11"=
3
~ trillion atoms/trillion molecules
~ The number of Cl atoms produced during the chemical conversion of
CFC-11. \
Determined from the molecular formula for CFC-11 (CFCl3)
|

"number of Cl atoms in one molecule of CFC-113"=
3
~ trillion atoms/trillion molecules
~ The number of Cl atoms produced during the chemical conversion of
CFC-113. \
Determined from the molecular formula for CFC-113 (C2F3Cl3)
|

"number of Cl atoms in one molecule of CFC-12"=
2
~ trillion atoms/trillion molecules
~ The number of Cl atoms produced during the chemical conversion of
CFC-12. \
Determined from the molecular formula for CFC-12 (CF2Cl2)
|

"amount of ozone that can be destroyed by Br and Cl from halon-1211"=
effectivness of Br in destroying ozone relative to Cl*number of stratospheric
ozone molecules destroyed by one Cl atom in a year\
*
"Reactive Br in the stratosphere due to halon-1211"+number of stratospheric
ozone molecules destroyed by one Cl atom in a year\
*"Reactive Cl in the stratosphere due to halon-1211"
~ trillion molecules
~ The sum of the ozone that can be destroyed by Cl and Br from halon-1211
in \
the stratosphere.
|

"annual CH3CCl3 production rate (actual)":=
GET XLS DATA('Real system data.xls', 'CH3CCl3 Production', 'A', 'E74')

~ thousand tons/Year
~ Doherty, R. 2000. "A history of the production and use of carbon \
tetrachloride, tetrachloroethylene, trichloroethylene and \
1,1,1-trichloroethane in the United States: Part 2" Journal of \
environmental forensics. Issue 1, pp. 83-93. Data from years 1989-2000 \
from the UNEP "Production and consumption of ozone depleting substances \
under the Montreal Protocol"
|

"number of Cl atoms in one molecule of HCFC-22"=
1
~ trillion atoms/trillion molecules
~ The number of Cl atoms produced during the chemical conversion of HCFC-22. \
Determined from the molecular formula for HCFC-22 (CHF2Cl)
|

"amount of ozone that can be destroyed by Cl from CFC-11"=
number of stratospheric ozone molecules destroyed by one Cl atom in a year*"Reactive Cl in the stratosphere due to CFC-11"
~ trillion molecules
~ The number of stratospheric ozone molecules that can be destoryed by \
current Cl released from CFC-11 present in the stratosphere.
|

amount of ozone that can be destroyed by Cl from CH3CCl3=
number of stratospheric ozone molecules destroyed by one Cl atom in a year*Reactive Cl in the stratosphere due to CH3CCl3
~ trillion molecules
~ The number of stratospheric ozone molecules that can be destoryed by \
current Cl released from CCl4 present in the stratosphere.
|

number of Cl atoms in one molecule of CH3CCl3=
3
~ trillion atoms/trillion molecules
~ The number of Cl atoms produced during the chemical conversion of CH3CCl3. \
Determined from the molecular formula for CH3CCl3
|

"% change in total stratospheric ozone from baseline value"=
-"% change in global total stratospheric ozone from baseline value (absolute)"
~ Dmnl
~ The actual % change in total stratospheric ozone. Model formulation \

prevents the total amount of stratospheric ozone from exceeding the \
initial value (see the variable "natural ozone destruction rate \
constant"). Therefore the % change in total ozone is always negative. A \
negative value is used for comparisons with actual measured data.
|

"% change in global total stratospheric ozone from baseline value (actual)":=
GET XLS DATA('Real system data.xls', '% Ozone Decrease', 'A', 'C7')
~ Dmnl
~ Data from Figure 13.1 in Fahey, D. 2006. "Twenty questions and answers \

about the ozone layer: 2006 update." Panel Review Meeting for the 2006 \
Ozone Assessment. Les Diablerets, Switzerland, June 19-23.
|

"annual CFC-113 emission rate (actual)":=
GET XLS DATA('Real system data.xls', 'CFC-113 Emission', 'A', 'B41')
~ thousand tons/Year
~ Actual CFC-113 emission data from the UNEP available at \

http://unfccc.int/files/methods_and_science/other_methodological_issues/int\
eractions_with_ozone_layer/application/pdf/cfc1300.pdf
|

"annual CFC-11 emission rate (actual)":=
GET XLS DATA('Real system data.xls', 'CFC-11 Emission' , 'A' , 'B39')
~ thousand tons/Year
~ Actual CFC-11 emission data from the UNEP available at \

http://unfccc.int/files/methods_and_science/other_methodological_issues/int\
eractions_with_ozone_layer/application/pdf/cfc1100.pdf
|

"annual HCFC-22 emission rate (actual)":=
GET XLS DATA('Real system data.xls', 'HCFC-22 Emission', 'A', 'B50')
~ thousand tons/Year
~ Actual HCFC-22 emission data from the UNEP available at \

http://unfccc.int/files/methods_and_science/other_methodological_issues/int\
eractions_with_ozone_layer/application/pdf/hcfc2200.pdf
|

"annual CFC-12 emission rate (actual)":=
GET XLS DATA('Real system data.xls', 'CFC-12 Emission', 'A', 'B38')
~ thousand tons/Year
~ Actual CFC-12 emission data from the UNEP available at \

http://unfccc.int/files/methods_and_science/other_methodological_issues/int\
eractions_with_ozone_layer/application/pdf/cfc1200.pdf
|

confidence of society in stratospheric ozone knowledge=
"% of atmospheric science puzzles resolved"*society's trust in scientists
~ Dmnl
~ The amount of confidence society in the scientific community is the \
product of the domain expert confidence, the effectiveness of domain \
experts in communication the message, and the amout of trust society has \
in science. A value of 1 represents complete confidence and a value of 0 \
indicates no confidence.
|

time to adjust scientist's estimation of the decrease in stratospheric ozone=
1
~ Year
~ This formulations assume that scientists adjust their ozone estimation \
every year.
|

"adjustment in scientists' estimation of the % change in stratospheric ozone"=
("gap in estimation of % decrease in stratospheric ozone"*"% of atmospheric science puzzles resolved"\
)/time to adjust scientist's estimation of the decrease in stratospheric ozone
~ Dmnl/Year
~ Scientists adjust their perceptions about the amount of stratospheric \
ozone depletion based upon the actual amount of depletion and their \
knowledge of the depletion. As atmospheric science puzzles are solved, \
scientist are able to better measure, understand, etc. the amount a change \
in stratopsheric ozone so the estimated % change approaches the actual % \
change more quickly.
|

development of chemical engineering knowledge=
("% of chemical engineering puzzles solved per dollar of funding"*funding for chemical engineering knowledge research\
*"% of atmospheric science puzzles resolved"*Unresolved ODS replacement engineering puzzles
)/time to develop chemical engineering knowledge
~ puzzles/Year
~ The development of engineering knowledge decreases the number of number of \

engineering puzzles left to be solved. Engineering knowledge development \
is more efficient with increased levels of scientific knowledge \
development. This formulation is based on Sterman's (1985) model of Kuhn's \
theory of knowledge development.
|

"halon-1211 molecules per thousand ton"=
3.36e+018
~ trillion molecules/thousand tons
~ There are 3.36e+30 molecules in one Giga-gram. 1 Giga-gram = 1000 metric \
tons
|

"annual decrease in halon-1301 emissions"=
"% of ODS replacement technology puzzles solved"*relative attention fraction of policy makers to ozone related cancer risks\
*"senstivity of Halon-1301 emission reduction to available replacement technology"
~ Dmnl
~ The annual decrease in halon-1301 emissions is based upon the attention \
paid to ozone depletion by policy makers and the availability of \
replacement technology. As attention to ozone depletion and available \
technology increases, environmental regulations seek to more rapidly \
decrease ozone emissions.
|

"annual decrease in halon-1211 emissions"=
"% of ODS replacement technology puzzles solved"*relative attention fraction of policy makers to ozone related cancer risks\
*"senstivity of Halon-1211 emission reduction to available replacement technology"
~ Dmnl
~ The annual decrease in halon-1211 emissions is based upon the attention \
paid to ozone depletion by policy makers and the availability of \
replacement technology. As attention to ozone depletion and available \
technology increases, environmental regulations seek to more rapidly \
decrease ozone emissions.
|

"min political willingness to restrict halon-1211 emissions"=
0.17
~ Dmnl

~ The minimum political willingness required to begin restricting halon-
1211 \
emissions.
|

"senstivity of Halon-1211 emission reduction to available replacement technology"=
3
~ Dmnl
~ Describes how sensensitive Halon-1211 emission restrictions are to \
replacement technology. A value of 0 indicates that no amount of \
replacement technology can be developed that will allow emission \
reductions. Negating the impact of policy maker attention, a value of 1 \
indicates that for every 1% of ODS replacement technology developed, \
emissions can be reduced by 1%. A number greater then 1 indicates a \
greater technology required to reduction ratio.
|

"desired annual industry growth in halon-1211 emissions"=
(1.2+STEP(-1,1968)+STEP(-0.08,1977))
~ Dmnl/Year
~ The industry desired annual growth in Halon-1211 emissions. The STEP \
functions are used to match measured emission data from Actual Halon-
1211 \
emission data from MuCulloch, A. 1992. "Global production and emission
of \
halon 1211 and 1301." Atmospheric Environment Vol. 26a (7). pp. 1325-
1329. \
Data from years 1989-2000 from the UNEP "Production and consumption
of \
ozone depleting substances under the Montreal Protocol"
|

annual decrease in CH3CCl3 emissions=
"% of ODS replacement technology puzzles solved"*relative attention fraction of policy makers to ozone related cancer risks\
*senstivity of CH3CCl3 emission reduction to available replacement
technology
~ Dmnl
~ The annual decrease in CH3CCl3 emissions is based upon the attention
paid \
to ozone depletion by policy makers and the availability of replacement \
technology. As attention to ozone depletion and available technology \
increases, environmental regulations seek to more rapidly decrease ozone \
emissions.
|

annual decrease in anthropogenic methyl bromide emissions=
"% of ODS replacement technology puzzles solved"*relative attention fraction of policy makers to ozone related cancer risks\
*sensitivity of anthropogenic methyl bromide emission reduction to replacement technology availability
~ Dmnl
~ The annual decrease in methyl bromide emissions is based upon the \
attention paid to ozone depletion by policy makers and the availability of \
replacement technology. As attention to ozone depletion and available \
technology increases, environmental regulations seek to more rapidly \
decrease ozone emissions.
|

"halon-1301 molecules per thousand ton"=
4.04e+018
~ trillion molecules/thousand tons
~ There are 4.04e+30 molecules in one Giga-gram. 1 Giga-gram = 1000 metric \
tons
|

senstivity of CH3CCl3 emission reduction to available replacement technology=
1.5
~ Dmnl
~ Describes how sensensitive CH3CCl3 emission restrictions are to \
replacement technology. A value of 0 indicates that no amount of \
replacement technology can be developed that will allow emission \
reductions. Negating the impact of policy maker attention, a value of 1 \
indicates that for every 1% of ODS replacement technology developed, \
emissions can be reduced by 1%. A number greater then 1 indicates a \
greater technology required to reduction ratio.
|

"senstivity of Halon-1301 emission reduction to available replacement technology"=
3
~ Dmnl
~ Describes how sensensitive Halon-1301 emission restrictions are to \
replacement technology. A value of 0 indicates that no amount of \
replacement technology can be developed that will allow emission \
reductions. Negating the impact of policy maker attention, a value of 1 \
indicates that for every 1% of ODS replacement technology developed, \
emissions can be reduced by 1%. A number greater then 1 indicates a \
greater technology required to reduction ratio.
|

sensitivity of anthropogenic methyl bromide emission reduction to replacement technology availability\
=
0.15
~ Dmnl
~ Describes how sensensitive anthropogenic methyl bromide emission \
restrictions are to replacement technology. A value of 0 indicates that no \
amount of replacement technology can be developed that will allow emission \
reductions. Negating the impact of policy maker attention, a value of 1 \
indicates that for every 1% of ODS replacement technology developed, \
emissions can be reduced by 1%. A number greater then 1 indicates a \
greater technology required to reduction ratio.
|

CH3CCl3 molecules per thousand ton=
4.5e+018
~ trillion molecules/thousand tons
~ There are 4.5e+30 molecules in one Giga-gram. 1 Giga-gram = 1000 metric \
tons
|

min political willingness to restrict anthropogenic methyl bromide emissions=
0.6
~ Dmnl
~ The minimum political willingness required to begin restricting methyl \
bromide emissions.
|

desired annual industry growth in CH3CCl3 emissions=
11
~ thousand tons/(Year*Year)
~ The industry desired annual growth in CH3CCl3 emissions. The constant is \
based on fitting ameasured emission data from actual CH3CCl3 emission data \
from Doherty, R. 2000. "A history of the production and use of carbon \
tetrachloride, tetrachloroethylene, trichloroethylene and \
1,1,1-trichloroethane in the United States: Part 2" Journal of \
environmental forensics. Issue 1, pp. 83-93. Data from years 1989-2000 \
from the UNEP "Production and consumption of ozone depleting substances \
under the Montreal Protocol"
|

methyl bromide molecules per thousand ton=
6.5e+018
~ trillion molecules/thousand tons
~ There are 6.5e+30 molecules in one Giga-gram. 1 Giga-gram = 1000 metric \
tons
|

"desired annual industry growth in halon-1301 emissions"=
(0.8+STEP(-0.55, 1972)+STEP(-0.13,1983))
~ Dmnl/Year
~ The industry desired annual growth in Halon-1301 emissions. The STEP \
functions are used to match measured emission data from Actual Halon-1301 \
emission data from MuCulloch, A. 1992. "Global production and emission of \
halon 1211 and 1301." Atmospheric Environment Vol. 26a (7). pp. 1325-1329. \
Data from years 1989-2000 from the UNEP "Production and consumption of \
ozone depleting substances under the Montreal Protocol"
|

"min political willingness to restrict halon-1301 emissions"=
0.04
~ Dmnl
~ The minimum political willingness required to begin restricting halon-1301 \
emissions.
|

desired annual industry growth in methyl bromide emissions=
2.6
~ thousand tons/(Year*Year)
~ The industry desired annual growth in anthropogenic MBr emissions. The \
constant is based on fitting ameasured emission data from actual \
anthropogenic MBr emission data from Duafla, T. and Gillis, M. \
"Properties, applications, and emissions of man-made methyl bromide." The \
handbook of environmental chemistry. 1999 Chapter 7. Years 1989-2000 from \
1989-2000 UNEP "Production and consumption of ozone depleting substances \
under the Montreal Protocol"
|

min political willingness to restrict CH3CCl3 emissions=
0.41
~ Dmnl
~ The minimum political willingness required to begin restricting CH3CCl3 \
emissions.
|

CCl4 molecules per thousand tons=
3.9e+018
~ trillion molecules/thousand tons
~ There are 3.9e+30 molecules in one Giga-gram. 1 Giga-gram = 1000 metric \
tons
|

"desired annual industry growth in CFC-11 emissions"=
(0.43+STEP(-0.3, 1954)+STEP(0.05, 1960)+STEP(-0.1, 1970))
~ Dmnl/Year
~ The industry desired annual growth in CFC-11 emissions. The STEP functions \
are used to match measured emission data from Actual CFC-11 emission data \
from the UNEP available at \

http://unfccc.int/files/methods_and_science/other_methodological_issues/int\
eractions_with_ozone_layer/application/pdf/cfc1100.pdf
|

senstivity of CCl4 emission reduction to available replacement technology=
2
~ Dmnl
~ Describes how sensensitive CCl4 emission restrictions are to replacement \
technology. A value of 0 indicates that no amount of replacement \
technology can be developed that will allow emission reductions. Negating \
the impact of policy maker attention, a value of 1 indicates that for \
every 1% of ODS replacement technology developed, emissions can be reduced \
by 1%. A number greater then 1 indicates a greater technology required to \
reduction ratio.
|

"senstivity of CFC-11 emission reduction to available replacement technology"=
1
~ Dmnl
~ Describes how sensensitive CFC-11 emission restrictions are to replacement \
technology. A value of 0 indicates that no amount of replacement \
technology can be developed that will allow emission reductions. Negating \
the impact of policy maker attention, a value of 1 indicates that for \
every 1% of ODS replacement technology developed, emissions can be reduced \
by 1%. A number greater then 1 indicates a greater technology required to \
reduction ratio.
|

"senstivity of CFC-113 emission reduction to available replacement technology"=
2
~ Dmnl
~ Describes how sensensitive CFC-113 emission restrictions are to \
replacement technology. A value of 0 indicates that no amount of \
replacement technology can be developed that will allow emission \
reductions. Negating the impact of policy maker attention, a value of 1 \
indicates that for every 1% of ODS replacement technology developed, \
emissions can be reduced by 1%. A number greater then 1 indicates a \
greater technology required to reduction ratio.
|

"senstivity of HCFC-22 emission reduction to available replacement technology"=
1
~ Dmnl
~ Describes how sensensitive aHCFC-22 emission restrictions are to \
replacement technology. A value of 0 indicates that no amount of \
replacement technology can be developed that will allow emission \
reductions. Negating the impact of policy maker attention, a value of 1 \
indicates that for every 1% of ODS replacement technology developed, \
emissions can be reduced by 1%. A number greater then 1 indicates a \
greater technology required to reduction ratio.
|

"CFC-113 molecules per thousand ton"=
3.21e+018
~ trillion molecules/thousand tons
~ There are 3.21e+30 molecules in one Giga-gram. 1 Giga-gram = 1000 metric \
tons

|

"CFC-12 molecules per thousand tons"=
4.98e+018
~ trillion molecules/thousand tons
~ There are 4.98e+30 molecules in one Giga-gram. 1 Giga-gram = 1000 metric \
tons
|

"min political willingness to restrict CFC-11 emissions"=
1.4e-005
~ Dmnl
~ The minimum political willingness required to begin restricting CFC-11 \
emissions.
|

annual decrease in CCl4 emissions=
"% of ODS replacement technology puzzles solved"*relative attention fraction of policy makers to ozone related cancer risks\
*senstivity of CCl4 emission reduction to available replacement technology
~ Dmnl
~ The annual decrease in CCl4 emissions is based upon the attention paid to \
ozone depletion by policy makers and the availability of replacement \
technology. As attention to ozone depletion and available technology \
increases, environmental regulations seek to more rapidly decrease ozone \
emissions.
|

min political willingness to restrict CCl4 emissions=
1.4e-005
~ Dmnl
~ The minimum political willingness required to begin restricting CCl4 \
emissions.
|

"min political willingness to restrict CFC-113 emissions"=
0.3
~ Dmnl
~ The minimum political willingness required to begin restricting CFC-113 \
emissions.
|

"min political willingness to restrict HCFC-22 emissions"=

4.6
~ Dmnl
~ The minimum political willingness required to begin restricting HCFC \
emissions.
|

"desired annual industry growth in CFC-113 emissions"=
(0.3+STEP(-0.2, 1966)+STEP(0.05, 1972)+STEP(-0.1, 1980)+STEP(0.08, 1983))
~ Dmnl/Year
~ The industry desired annual growth in CFC-113 emissions. The STEP \
functions are used to match measured emission data from Actual CFC-113 \
emission data from the UNEP available at \
http://unfccc.int/files/methods_and_science/other_methodological_issues/int\
eractions_with_ozone_layer/application/pdf/cfc1300.pdf
|

"annual percent of allowed CFC-11 baseline emissions"=
"% of ODS replacement technology puzzles solved"*relative attention fraction of policy makers to ozone related cancer risks\
*"senstivity of CFC-11 emission reduction to available replacement technology"
~ Dmnl
~ The annual decrease in CFC-11 emissions is based upon the attention paid \
to ozone depletion by policy makers and the availability of replacement \
technology. As attention to ozone depletion and available technology \
increases, environmental regulations seek to more rapidly decrease ozone \
emissions.
|

"annual decrease in CFC-113 emissions"=
"% of ODS replacement technology puzzles solved"*relative attention fraction of policy makers to ozone related cancer risks\
*"senstivity of CFC-113 emission reduction to available replacement technology"
~ Dmnl
~ The annual decrease in CFC-113 emissions is based upon the attention paid \
to ozone depletion by policy makers and the availability of replacement \
technology. As attention to ozone depletion and available technology \
increases, environmental regulations seek to more rapidly decrease ozone \
emissions.
|

"annual decrease in HCFC-22 emissions"=
"% of ODS replacement technology puzzles solved"*relative attention fraction of policy makers to ozone related cancer risks\
*"senstivity of HCFC-22 emission reduction to available replacement technology"
~ Dmnl
~ The annual decrease in HCFC emissions is based upon the attention paid to \
ozone depletion by policy makers and the availability of replacement \
technology. As attention to ozone depletion and available technology \
increases, environmental regulations seek to more rapidly decrease ozone \
emissions.
|

desired annual industry growth in CCl4 emissions=
(0.5+STEP(-0.37, 1927)+STEP(-0.08,1942)+STEP(0.03,1960))
~ Dmnl/Year
~ The industry desired annual growth in CCl4 emissions. The STEP functions \
are used to match measured emission data from Actual CCl4 emission data \
from Doherty, R. 2000. "A history of the production and use of carbon \
tetrachloride, tetrachloroethylene, trichloroethylene and \
1,1,1-trichloroethane in the United States: Part 2" Journal of \
environmental forensics. Issue 1, pp. 83-93. Data from years 1989-2000 \
from the UNEP "Production and consumption of ozone depleting substances \
under the Montreal Protocol"
|

"HCFC-22 molecules per thousand ton"=
4.67e+018
~ trillion molecules/thousand tons
~ There are 4.67e+30 molecules in one Giga-gram. 1 Giga-gram = 1000 metric \
tons
|

"CFC-11 molecules per thousand ton"=
4.38e+018
~ trillion molecules/thousand tons
~ There are 4.38e+30 molecules in one Giga-gram. 1 Giga-gram = 1000 metric \
tons
|

"desired annual industry growth in HCFC-22 emissions"=
5.2
~ thousand tons/(Year*Year)
~ The industry desired annual growth in HCFC-22 emissions. The constant is \
based on fitting ameasured emission data from actual HCFC-22 emission data \
from the UNEP available at \

http://unfccc.int/files/methods_and_science/other_methodological_issues/int\
eractions_with_ozone_layer/application/pdf/hcfc2200.pdf
|

"senstivity of CFC-12 emission reduction to available replacement technology"=
0.7
~ Dmnl
~ Describes how sensensitive CFC-12 emission restrictions are to replacement \
technology. A value of 0 indicates that no amount of replacement \
technology can be developed that will allow emission reductions. Negating \
the impact of policy maker attention, a value of 1 indicates that for \
every 1% of ODS replacement technology developed, emissions can be reduced \
by 1%. A number greater then 1 indicates a greater technology required to \
reduction ratio.
|

"annual decrease in CFC-12 emissions"=
"% of ODS replacement technology puzzles solved"*relative attention fraction of policy makers to ozone related cancer risks\
*"senstivity of CFC-12 emission reduction to available replacement technology"
~ Dmnl
~ The annual decrease in CFC-12 emissions is based upon the attention paid \
to ozone depletion by policy makers and the availability of replacement \
technology. As attention to ozone depletion and available technology \
increases, environmental regulations seek to more rapidly decrease ozone \
emissions.
|

"min political willingness to restrict CFC-12 emissions"=
1.4e-005
~ Dmnl

~ The minimum political willingness required to begin restricting CFC-12 \
emissions.
|

"desired annual industry growth in CFC-12 emissions"=
(0.55+STEP(-0.42, 1945)+STEP(-0.04, 1970))
~ Dmnl/Year
~ The industry desired annual growth in CFC-12 emissions. The STEP functions \
are used to match measured emission data from Actual CFC-12 emission data \
from the UNEP available at \

http://unfccc.int/files/methods_and_science/other_methodological_issues/int\
eractions_with_ozone_layer/application/pdf/cfc1200.pdf
|

min time to destroy ozone=
1
~ Year
~ The time over which the current levels of Cl and Br destroy ozone. 1 year \
is used since the model is formulated to annual ODS production rates.
|

CH3CCl3 in the stratosphere= INTEG (
+transport of CH3CCl3 to the stratosphere-chemical conversion of CH3CCl3,
0)
~ trillion molecules
~ The number of molecults of CH3CCl3 in the stratosphere. Increases with an \
increased transport of CH3CCl3 from the troposphere and decreases as \
CH3CCl4 reacts and is converted to Cl and other particles.
|

CH3CCl3 in the troposphere= INTEG (
+CH3CCl3 emissions-removal of CH3CCl3 from the troposphere-transport of CH3CCl3 to the stratosphere\
,
0)
~ trillion molecules
~ The number of molecules of CFC-12 in the troposphere. Increases as CFC-12 \
emissions increase and decreases as CFC-12 molecules are transported to \
the stratosphere.
|

"% of CCl4 transported to the stratosphere"=
1
~ Dmnl
~ Chapter 1 of the 1991 UNEP "Scientific assessment of ozone depletion" \
states that CFC and CCl4 are inert in the stratosphere. Document source \
http://www.ciesin.org/docs/011-429/011-429.html
|

"removal of halon-1301 from the troposphere"=
((1-"% of halon-1301 transported to the stratosphere")*"Halon-1301 in the troposphere"\
)/"time to remove halon-1301 from the troposphere"
~ trillion molecules/Year
~ The number of molecules that are removed in the troposphere due to natural \
sinks and chemical reactions.
|

"removal of HCFC-22 from the troposphere"=
((1-"% of HCFC-22 transported to the stratosphere")*"HCFC-22 in the troposphere")/"time to remove HCFC-22 from the troposphere"
~ trillion molecules/Year
~ The number of molecules that are removed in the troposphere due to natural \
sinks and chemical reactions.
|

"% of CH3CCl3 transported to the stratosphere"=
0.9
~ Dmnl
~ According to Figure 5 of the Evironmental Health Criteria-166 "Methyl \
Bromide" published by the International Program on Chemical Safety CH3CCl3 \
is partially removed in the troposphere so 90% of the molecules are \
transported to the stratosphere. Document available at \
http://www.inchem.org/documents/ehc/ehc/ehc166.htm
|

Br lifetime=
1
~ Year
~ The ifetime of Br in the stratosphere, estmated from Figure 4.29 in \
Dessler "The chemistry and physics of stratospheric ozone." The figure \
shows that at an altitude of 25km the lifetime of Br is approximately \
10^-2 days or 2.74e-5 years. For the purposes of this model all reactive \
Br in the stratosphere is assumed to be destroyed in one year.

|

"% of halon-1211 transported to the stratosphere"=
1
~ Dmnl
~ According to Figure 6 from "Global distribution of halocarbons" by
Fabian \
et al (1996) published in "Atmospheric Environment" there is no removal
of \
halon-1211 in the troposphere so 100% of the emissions reach the \
stratosphere.
|

"% of halon-1301 transported to the stratosphere"=
1
~ Dmnl
~ According to Figure 6 from "Global distribution of halocarbons" by
Fabian \
et al (1996) published in "Atmospheric Environment" there is no removal
of \
halon-1301 in the troposphere so 100% of the emissions reach the \
stratosphere.
|

"% of HCFC-22 transported to the stratosphere"=
0.92
~ Dmnl
~ From Figure 6 in Fabian et al. (1996) "Global stratospheric distribution \
of halocarbons" approximately 8% of HCFC-22 is destroyed in the \
troposphere.
|

"% of methyl bromide transported to the stratosphere"=
0.9
~ Dmnl
~ From Figure 4 of Evironmental Health Criteria-166 "Methyl Bromide" \
published by the International Program on Chemical Safety approximately
\
10% of methyl bromide is removed in the troposphere. Document
available at \
http://www.inchem.org/documents/ehc/ehc/ehc166.htm
|

"removal of Br produced from halon-1211 from the stratosphere"=
"Reactive Br in the stratosphere due to halon-1211"/Br lifetime
~ trillion atoms/Year

~ The removal of Br from halon-1211 from the stratosphere based on the \
atmospheric lifetime of Br.

|

"removal of Br produced from halon-1301 from the stratosphere"=
"Reactive Br in the stratosphere due to halon-1301"/Br lifetime
~ trillion atoms/Year
~ The removal of Br from Halon-1301 from the stratosphere based on the \
average atmospheric lifetime of Br.

|

removal of Br produced from anthropogenic methyl bromide from the stratosphere=
Reactive Br in the stratosphere due to anthropogenic methyl bromide/Br lifetime
~ trillion atoms/Year
~ The removal of Br from MBr the stratosphere based on the average \
atmospheric lifetime of Br.

|

removal of CCl4 from the troposphere=
((1-"% of CCl4 transported to the stratosphere")*CCl4 in the troposphere)/time to remove CCl4 from the troposphere
~ trillion molecules/Year
~ The number of molecules that are removed in the troposphere due to natural \
sinks and chemical reactions.

|

"halon-1211 atmospheric lifetime"=
16
~ Year
~ The atmospheric lifetime of Halon-1211. From Table Q7-1 in Fahey, D. 2006. \
"Twenty questions and answers about the ozone layer: 2006 update." Panel \
Review Meeting for the 2006 Ozone Assessment. Les Diablerets, Switzerland, \
June 19-23.

|

"amount of ozone that can be destroyed by Br from halon-1301"=
number of stratospheric ozone molecules destroyed by one Cl atom in a year*effectivness of Br in destroying ozone relative to Cl\
*"Reactive Br in the stratosphere due to halon-1301"
~ trillion molecules
~ The number of stratospheric ozone molecules that can be destoryed by \
current Br released from Halon-1301 present in the stratosphere.

|

removal of CH3CCl3 from the troposphere=
((1-"% of CH3CCl3 transported to the stratosphere")*CH3CCl3 in the troposphere)/time to remove CH3CCl3 from the troposphere
~ trillion molecules/Year
~ The number of molecules that are removed in the troposphere due to natural \
sinks and chemical reactions.
|

CCl4 atmospheric lifetime=
26
~ Year
~ The atmospheric lifetime of CCl4. From Table Q7-1 in Fahey, D. 2006. \
"Twenty questions and answers about the ozone layer: 2006 update." Panel \
Review Meeting for the 2006 Ozone Assessment. Les Diablerets, Switzerland, \
June 19-23.
|

CCl4 in the stratosphere= INTEG (
+transport of CCl4 to the stratosphere-chemical conversion of CCl4,
0)
~ trillion molecules
~ The number of molecults of CCl4 in the stratosphere. Increases with an \
increased transport of CCl4 from the troposphere and decreases as CCl4 \
reacts and is converted to Cl and other particles.
|

CCl4 in the troposphere= INTEG (
+CCl4 emissions-removal of CCl4 from the troposphere-transport of CCl4 to the stratosphere\
,
0)
~ trillion molecules
~ The number of molecules of CFC-12 in the troposphere. Increases as CFC-12 \
emissions increase and decreases as CFC-12 molecules are transported to \
the stratosphere.
|

transport of CH3CCl3 to the stratosphere=
("% of CH3CCl3 transported to the stratosphere"*CH3CCl3 in the troposphere)/time for ODS to move from the troposhere to the stratosphere

~ trillion molecules/Year
~ Describes the movement of molecules from the troposphere to the \
stratosphere due to wind currents, convection, and other atmospheric \
transport processes.
|

"transport of halon-1211 to the stratosphere"=
("% of halon-1211 transported to the stratosphere"*"Halon-1211 in the troposphere")/\
time for ODS to move from the troposhere to the stratosphere
~ trillion molecules/Year
~ Describes the movement of molecules from the troposphere to the \
stratosphere due to wind currents, convection, and other atmospheric \
transport processes.
|

"transport of halon-1301 to the stratosphere"=
("% of halon-1301 transported to the stratosphere"*"Halon-1301 in the troposphere")/\
time for ODS to move from the troposhere to the stratosphere
~ trillion molecules/Year
~ Describes the movement of molecules from the troposphere to the \
stratosphere due to wind currents, convection, and other atmospheric \
transport processes.
|

"transport of HCFC-22 to the stratosphere"=
("% of HCFC-22 transported to the stratosphere"*"HCFC-22 in the troposphere")/time for ODS to move from the troposhere to the stratosphere
~ trillion molecules/Year
~ Describes the movement of molecules from the troposphere to the \
stratosphere due to wind currents, convection, and other atmospheric \
transport processes.
|

transport of anthropogenic methyl bromide to the stratosphere=
("% of methyl bromide transported to the stratosphere"*Anthropogenic methyl bromide in the troposphere\
)/time for ODS to move from the troposhere to the stratosphere
~ trillion molecules/Year
~ Describes the movement of molecules from the troposphere to the \
stratosphere due to wind currents, convection, and other atmospheric \
transport processes.
|

methyl bormide atmospheric lifetime=

0.7
~ Year
~ The atmospheric lifetime of MBr. From Table Q7-1 in Fahey, D. 2006. \
"Twenty questions and answers about the ozone layer: 2006 update."
Panel \
Review Meeting for the 2006 Ozone Assessment. Les Diablerets,
Switzerland, \
June 19-23.
|

Anthropogenic methyl bromide in the stratosphere= INTEG (
+transport of anthropogenic methyl bromide to the stratosphere-chemical
conversion of anthropogenic methyl bromide\
,
0)
~ trillion molecules
~ The number of molecults of MBR in the stratosphere. Increases with an \
increased transport of MBr from the troposphere and decreases as MBr \
reacts and is converted to Cl and other particles.
|

removal of Cl produced from CCl4 from the stratosphere=
Reactive Cl in the stratosphere due to CCl4/Cl lifetime
~ trillion atoms/Year
~ The removal of CL from CCl4 from the stratosphere based on the average
\
atmospheric lifetime of Cl.
|

"Halon-1211 in the troposphere"= INTEG (
+"halon-1211 emissions"-"removal of halon-1211 from the troposphere"-
"transport of halon-1211 to the stratosphere"\
,
0)
~ trillion molecules
~ The number of molecules of CFC-12 in the troposphere. Increases as
CFC-12 \
emissions increase and decreases as CFC-12 molecules are transported to \
the stratosphere.
|

CH3CCl3 atmospheric lifetime=
5
~ Year
~ The atmospheric lifetime of CH3CCl3. From Table Q7-1 in Fahey, D.
2006. \

"Twenty questions and answers about the ozone layer: 2006 update."
Panel \
Review Meeting for the 2006 Ozone Assessment. Les Diablerets,
Switzerland, \
June 19-23.
|

removal of Cl produced from CH3CCl3 from the stratosphere=
Reactive Cl in the stratosphere due to CH3CCl3/Cl lifetime
~ trillion atoms/Year
~ The removal of CL from CH3CCl3 from the stratosphere based on the
average \
atmospheric lifetime of Cl.
|

"removal of Cl produced from HCFC-22 from the stratosphere"=
"Reactive Cl in the stratosphere due to HCFC-22"/Cl lifetime
~ trillion atoms/Year
~ The removal of CL from HCFC-22 from the stratosphere based on the
average \
atmospheric lifetime of Cl.
|

"HCFC-22 atmospheric lifetime"=
13
~ Year
~ The atmospheric lifetime of HCFC-22. From Table Q7-1 in Fahey, D.
2006. \
"Twenty questions and answers about the ozone layer: 2006 update."
Panel \
Review Meeting for the 2006 Ozone Assessment. Les Diablerets,
Switzerland, \
June 19-23.
|

"removal of halon-1211 from the troposphere"=
((1-"% of halon-1211 transported to the stratosphere")*"Halon-1211 in the
troposphere"\
)/"time to remove halon-1211 from the troposphere"
~ trillion molecules/Year
~ The number of molecules that are removed in the troposphere due to
natural \
sinks and chemical reactions.
|

"HCFC-22 in the stratosphere"= INTEG (

```
	+"transport of HCFC-22 to the stratosphere"-"reaction of HCFC-22 to form Cl",
		0)
	~	trillion molecules
	~	The number of molecults of HCFC-22 in the stratosphere. Increases with 
an \
		increased transport of HCFC-22 from the troposphere and decreases as \
		HCFC-22 reacts and is converted to Cl and other particles.
	|

"HCFC-22 in the troposphere"= INTEG (
	+"HCFC-22 emissions"-"removal of HCFC-22 from the troposphere"-"transport 
of HCFC-22 to the stratosphere"\
		,
		0)
	~	trillion molecules
	~	The number of molecules of CFC-12 in the troposphere. Increases as 
CFC-12 \
		emissions increase and decreases as CFC-12 molecules are transported to \
		the stratosphere.
	|

removal of anthropogenic methyl bromide from the troposphere=
	((1-"% of methyl bromide transported to the stratosphere")*Anthropogenic 
methyl bromide in the troposphere\
		)/time to remove methyl bromide from the troposphere
	~	trillion molecules/Year
	~	The number of molecules that are removed in the troposphere due to 
natural \
		sinks and chemical reactions.
	|

time to remove methyl bromide from the troposphere=
	4
	~	Year
	~	Assumed equal to the time to transport ODS from the troposphere to the \
		stratosphere.
	|

"Halon-1301 in the troposphere"= INTEG (
	+"halon-1301 emissions"-"removal of halon-1301 from the troposphere"-
"transport of halon-1301 to the stratosphere"\
		,
		0)
	~	trillion molecules
	~	The number of molecules of CFC-12 in the troposphere. Increases as 
CFC-12 \
```

emissions increase and decreases as CFC-12 molecules are transported to \
the stratosphere.
|

Anthropogenic methyl bromide in the troposphere= INTEG (
+methyl bromide emissions-removal of anthropogenic methyl bromide from the troposphere\
-transport of anthropogenic methyl bromide to the stratosphere,
0)
~ trillion molecules
~ The number of molecules of CFC-12 in the troposphere. Increases as CFC-12 \
emissions increase and decreases as CFC-12 molecules are transported to \
the stratosphere.
|

effectivness of Br in destroying ozone relative to Cl=
10
~ Dmnl
~ From Table Q7-1 in Fahey, D. 2006. "Twenty questions and answers about the \
ozone layer: 2006 update." Panel Review Meeting for the 2006 Ozone \
Assessment. Les Diablerets, Switzerland, June 19-23 The ozone depletion \
potential of bromind containing compounds is roughly 10 time that of \
chlorine containing compounds. Thus, the model assumes that a single Br \
molecule can destroy 10 times the number of ozone molecules as a Cl \
molecule.
|

"time to remove halon-1211 from the troposphere"=
4
~ Year
~ Assumed equal to the time to transport ODS from the troposphere to the \
stratosphere.
|

"time to remove halon-1301 from the troposphere"=
4
~ Year
~ The time required to remove CFC-12 from the troposphere.
|

"Halon-1301 in the stratosphere"= INTEG (

+"transport of halon-1301 to the stratosphere"-"chemical conversion of halon-1301",
0)
~ trillion molecules
~ The number of molecults of Halon 1301 in the stratosphere. Increases with \
an increased transport of Halon 1301 from the troposphere and decreases \
as Halon 1301 reacts and is converted to Br and other particles.
|

transport of CCl4 to the stratosphere=
("% of CCl4 transported to the stratosphere"*CCl4 in the troposphere)/time for ODS to move from the troposhere to the stratosphere
~ trillion molecules/Year
~ Describes the movement of molecules from the troposphere to the \
stratosphere due to wind currents, convection, and other atmospheric \
transport processes.
|

"halon-1301 atmospheric lifetime"=
65
~ Year
~ The atmospheric lifetime of Halon-1301. From Table Q7-1 in Fahey, D. 2006. \
"Twenty questions and answers about the ozone layer: 2006 update." Panel \
Review Meeting for the 2006 Ozone Assessment. Les Diablerets, Switzerland, \
June 19-23.
|

time to remove CH3CCl3 from the troposphere=
10
~ Year
~ Assumed equal to the time to transport ODS from the troposphere to the \
stratosphere.
|

"time to remove HCFC-22 from the troposphere"=
4
~ Year
~ Assumed equal to the time to transport ODS from the troposphere to the \
stratosphere.
|

time to remove CCl4 from the troposphere=

4
~ Year
~ Assumed equal to the time to transport ODS from the troposphere to the \
stratosphere.
|

"removal of Cl produced from CFC-113 from the stratosphere"=
"Reactive Cl in the stratosphere due to CFC-113"/Cl lifetime
~ trillion atoms/Year
~ The removal of CL from CFC-113 from the stratosphere based on the average \
atmospheric lifetime of Cl.
|

"CFC-11 in the troposphere"= INTEG (
+"CFC-11 emissions"-"removal of CFC-11 from the troposphere"-"transport of CFC-11 to the stratosphere"\
,
0)
~ trillion molecules
~ The number of molecules of CFC-11 in the troposphere. Increases as CFC-11 \
emissions increase and decreases as CFC-1 molecules are transported to the \
stratosphere or removed from the troposphere.
|

"CFC-113 atmospheric lifetime"=
85
~ Year
~ The atmospheric lifetime of CFC-11. From Table Q7-1 in Fahey, D. 2006. \
"Twenty questions and answers about the ozone layer: 2006 update." Panel \
Review Meeting for the 2006 Ozone Assessment. Les Diablerets, Switzerland, \
June 19-23.
|

"% of CFC-11 transported to the stratosphere"=
1
~ Dmnl
~ According to Figure 5 of the Evironmental Health Criteria-166 "Methyl \
Bromide" published by the International Program on Chemical Safety CFC-11 \

is not removed in the troposphere so 100% of the molecules are transported \
to the stratosphere. Document available at \
http://www.inchem.org/documents/ehc/ehc/ehc166.htm
|

"% of CFC-113 transported to the stratosphere"=
1
~ Dmnl
~ A UNEP report available at \
http://ozone.unep.org/Meeting_Documents/ccol/ccol8/ccol8-recent_research_re\
sults_by_german.86-02-01.doc shows that there is no lose of CFC-113 in the \
troposphere. Also, Chapter 1 of the 1991 UNEP "Scientific assessment of \
ozone depletion" states that CFC and CCl4 are inert in the stratosphere. \
Document source http://www.ciesin.org/docs/011-429/011-429.html
|

"time to remove CFC-11 from the troposphere"=
4
~ Year
~ Assumed equal to the time to transport ODS from the troposphere to the \
stratosphere.
|

"time to remove CFC-113 from the troposphere"=
4
~ Year
~ Assumed equal to the time to transport ODS from the troposphere to the \
stratosphere.
|

"removal of CFC-11 from the troposphere"=
((1-"% of CFC-11 transported to the stratosphere")*"CFC-11 in the troposphere")/"time to remove CFC-11 from the troposphere"
~ trillion molecules/Year
~ The number of molecules that are removed in the troposphere due to natural \
sinks and chemical reactions.
|

"transport of CFC-113 to the stratosphere"=
("% of CFC-113 transported to the stratosphere"*"CFC-113 in the troposphere")/time for ODS to move from the troposhere to the stratosphere
~ trillion molecules/Year

~ Describes the movement of molecules from the troposphere to the \
stratosphere due to wind currents, convection, and other atmospheric \
transport processes.
|

"removal of Cl produced from CFC-11 from the stratosphere"=
"Reactive Cl in the stratosphere due to CFC-11"/Cl lifetime
~ trillion atoms/Year
~ The removal of CL from CFC-11 from the stratosphere based on the average \
atmospheric lifetime of Cl.
|

"CFC-113 in the stratosphere"= INTEG (
+"transport of CFC-113 to the stratosphere"-"chemical conversion of CFC-113",
0)
~ trillion molecules
~ The number of molecults of CFC-113 in the stratosphere. Increases with an \
increased transport of CFC-113 from the troposphere and decreases as \
CFC-113 reacts and is converted to Cl and other particles.
|

"CFC-113 in the troposphere"= INTEG (
+"CFC-113 emissions"-"removal of CFC-113 from the troposphere"-"transport of CFC-113 to the stratosphere"\
,
0)
~ trillion molecules
~ The number of molecules of CFC-12 in the troposphere. Increases as CFC-12 \
emissions increase and decreases as CFC-12 molecules are transported to \
the stratosphere.
|

"CFC-11 atmospheric lifetime"=
45
~ Year
~ The atmospheric lifetime of CFC-11. From Table Q7-1 in Fahey, D. 2006. \
"Twenty questions and answers about the ozone layer: 2006 update." Panel \
Review Meeting for the 2006 Ozone Assessment. Les Diablerets, Switzerland, \
June 19-23.
|

"removal of CFC-113 from the troposphere"=
((1-"% of CFC-113 transported to the stratosphere")*"CFC-113 in the troposphere")/"time to remove CFC-113 from the troposphere"
~ trillion molecules/Year
~ The number of molecules that are removed in the troposphere due to natural \
sinks and chemical reactions.
|

"transport of CFC-11 to the stratosphere"=
("% of CFC-11 transported to the stratosphere"*"CFC-11 in the troposphere")/time for ODS to move from the troposhere to the stratosphere
~ trillion molecules/Year
~ Describes the movement of molecules from the troposphere to the \
stratosphere due to wind currents, convection, and other atmospheric \
transport processes.
|

"% increase in skin cancer per % decrease in stratospheric ozone"=
0.035
~ Dmnl
~ In "Protecting the Ozone Layer" Anderssen and Sarma summarize scientific \
studies and say that there will be a 2% to 5% increase in skin cancer per \
1% decrease in stratospheric ozone. The model assume the median value of \
3.5%.
|

scientists' estimation of the percent increased skin cancer risk from stratospheric ozone depletion\
=
("% increase in skin cancer per % decrease in stratospheric ozone"*100)*("Scientists' estimation of the % decrease in stratospheric ozone"\
*100)/100
~ Dmnl
~ Scientist's perception of the increase in cancer risks from stratospheric \
ozone depletion is based upon their perception of the change in the amount \
of stratospheric ozone and the cancer risks associated with that change. \
Multiplying and dividing by 100 converts the decimal to percent and then \
back to a decimal.
|

amplification risk factor for stratospheric ozone depletion=

1
~ Dmnl
~ Socity's amplification of the risks associated with stratospheric ozone \
depletion. Kasperson et al's theory of risk amplification shows that \
society can amplify a given risk (factor >1) or attenuate a risk (factor \
<1). A value of 1 indicates that society's perception of the risk is \
identical to the scientific perception of the risk. The model assumes a \
value of 1 for stratospheric ozone depletion.
|

change in society's ozone depletion related skin cancer risk perception=
difference between society's risk perception and scientist's risk perception*effectiveness of domain experts in communicating with society
~ Dmnl/Year
~ The change in society's perception of increased skin cancer risks \
associated with stratospheric ozone depletion. Society's risk perception \
approaches scientist's risk perception at a faster rate as domain experts \
communication effectiveness increases.
|

"Scientists' estimation of the % decrease in stratospheric ozone"= INTEG (
"adjustment in scientists' estimation of the % change in stratospheric ozone",
0)
~ Dmnl
~ Scientists current estimation of the % decrease in the amount of \
stratospheric ozone.
|

"gap in estimation of % decrease in stratospheric ozone"=
"% change in global total stratospheric ozone from baseline value (absolute)"-"Scientists' estimation of the % decrease in stratospheric ozone"
~ Dmnl
~ The difference between the actual % change in stratospheric ozone and \
scientist estimated % change in stratospheric ozone.
|

difference between society's risk perception and scientist's risk perception=
society's perception of percent increased skin cancer risks from stratospheric ozone depletion based upon science\
-Society's perception of percent increased skin cancer risks due to ozone depletion
~ Dmnl
~ The gap between society's risk perception and scientist's risk perception \
of increased cancer risks associated with stratospheric ozone depletion.
|

society's trust in scientists=
0.7
~ Dmnl
~ Describes the amount of trust society places on scientists. A value of 1 \
indicates complete trust, a value of 0 indicates no trust. According to \
Kasperson et al's risk amplification framework, society is more likely to \
believe domain experts risk warnings if they have a higher level of trust \
in the experts.
|

society's perception of percent increased skin cancer risks from stratospheric ozone depletion based upon science\
=
confidence of society in stratospheric ozone knowledge*scientists' estimation of the percent increased skin cancer risk from stratospheric ozone depletion\
*amplification risk factor for stratospheric ozone depletion
~ Dmnl
~ Socity's risk perception of increased skin cancer risk due to \
stratospheric ozone depletion based upon the scientific risk assessment, \
society's amplification of that risk assessment, and society's confidence \
in scientific knowledge of stratospheric ozone depletion.
|

"% change in global total stratospheric ozone from baseline value (absolute)"=
((average initial steady state stratospheric ozone-"Total stratospheric ozone (actual)"\
)/average initial steady state stratospheric ozone)
~ Dmnl
~ The absolute % change in total stratospheric ozone.
|

"society's initial perception of % increased skin cancer risks from ozone depletion"=
0
~ Dmnl
~ Society's initial perception of of increased skin cancer risks due to \
stratospheric ozone depletion. This parameter, by definition, is zero.
|

"removal of Cl produced from CFC-12 from the stratosphere"=
"Reactive Cl in the stratosphere due to CFC-12"/Cl lifetime
~ trillion atoms/Year
~ The removal of CL from CFC-12 from the stratosphere based on the average \
atmospheric lifetime of Cl.
|

Cl lifetime=
20
~ Year
~ The average lifetime of Cl in the stratosphere. Estimated from Dressler \
"The chemistry and physics of stratospheric ozone" Figure 4.2, p 64. The \
value can range between 1 year and 200 years depending upon alttitude.
|

"CFC-12 in the troposphere"= INTEG (
+"annual CFC-12 emissions (molecules)"-"removal of CFC-12 from the troposphere"-"transport of CFC-12 to the stratosphere"\
,
0)
~ trillion molecules
~ The number of molecules of CFC-12 in the troposphere. Increases as CFC-12 \
emissions increase and decreases as CFC-12 molecules are transported to \
the stratosphere.
|

"CFC-12 in the stratosphere"= INTEG (
+"transport of CFC-12 to the stratosphere"-"chemical conversion of CFC-12",
0)
~ trillion molecules
~ The number of molecults of CFC-12 in the stratosphere. Increases with an \
increased transport of CFC-12 from the troposphere and decreases as CFC-12 \
reacts and is converted to Cl and other particles.
|

average initial steady state stratospheric ozone=
4.154e+025
~ trillion molecules
~ The average initial stratospheric ozone value in the baseline year 1980. \
The initial value is from Figure 3-1 of the UNEP 2007 report, which \
reports total ozone as 300 Dobson's between 60S-60N. This is the assumed \
to be unitform around the entire earth and is converted to moledules.
|

increase of policy maker attention to ozone related cancer concerns due to societal pressure\
=

sensitivity of policy maker attention to society's ozone related cancer concerns*Society's perception of percent increased skin cancer risks due to ozone depletion
~ hours/Year
~ The amount of policy maker attention increase due to societial risk \
perception of cancer risks from ozone depletion. This formulation is based \
on Kingdon's (2003) problem stream.
|

maximum annual policy maker attention to ozone related cancer risks=
maximum percentage of total policy maker attention that can be devoted to ozone related cancer risks\
*maximum annual attention available for ozone issues
~ hours/Year
~ The maximum number of hours policy makers can pay attention to ozone \
related cancer risks.
|

Unresolved ODS replacement technology puzzles= INTEG (
-development of ODS replace technology,
initial unresolved ODS replacement technology puzzles)
~ puzzles
~ The current level of nuclear safety technology.
|

"% of ODS replacement technology puzzles solved"=
1-(Unresolved ODS replacement technology puzzles/initial unresolved ODS replacement technology puzzles\
)
~ Dmnl
~ Reflects the level of technology developed. A higher percentage indicates \
a greater level of technology available.
|

"% of ODS replacement technology puzzles solved per dollar of funding"=
5e-005
~ Dmnl/million $
~ The percentage of puzzles solved per dollar of funding. Reflects the \
difficulty level of puzzles to be solved.
|

decrease policy maker annual attention to ozone related cancer risks=
"% yearly errosion of policy maker attention"*Annual attention of policy makers to ozone related cancer risks

~ hours/(Year*Year)
~ The errosion of policy maker attention to ozone related cancer risks. This \
formulation is based on Kingdon's (2003) problem stream.
|

initial unresolved ODS replacement technology puzzles=
10000
~ puzzles
~ The initial number of replacement technology puzzles to be solved.
|

development of ODS replace technology=
(Unresolved ODS replacement technology puzzles*"% of ODS replacement technology puzzles solved per dollar of funding"\
funding for ODS replacement technology development"% of ODS replacement engineering puzzles resolved"\
)/time to develop technology
~ puzzles/Year
~ Technology development increases with increased funding, inscreased \
effeciency of technology development, and increased chemical engineering \
knowledge. This formulation is based on Sterman's (1985) model of Kuhn's \
theory of knowledge development.
|

maximum annual policy maker attention to ODS regulation economic risks=
maximum percentage of total policy maker attention that can be devoted to ODS regulation risks\
*maximum annual attention available for ozone issues
~ hours/Year
~ The maximum number of hours policy makers can pay attention to ozone \
regulation economic risks.
|

increase policy maker annual attention to ozone related cancer concerns=
MIN(((increase of policy maker attention to ozone reated cancer risks due to scientific knowledge\
+increase of policy maker attention to ozone related cancer concerns due to societal pressure\
)/time required to increase policy maker attention to ozone related cancer concerns\
),((maximum annual policy maker attention to ozone related cancer risks-Annual attention of policy makers to ozone related cancer risks\
)/time required to raise policy maker attention to maximum level))
~ hours/Year/Year

~ The increase in policy maker attention to ozone replated cancer risks is \
driven by society's NPP risk perception. The MIN fuction prevents the \
attention of policy makers to NPP radiation concerns from exceeding the \
maximum allowable attention. This formulation is based on Kingdon's
(2003) \
problem stream.
|

funding for chemical engineering knowledge research=
engineering funding per hour of policy maker attention*total annual attention of policy makers to ozone issues
~ million $
~ The total amount of annual funding for engineering knowledge
development \
increases with increased unit funding and increased policy maker attention
\
to the cancer risks from ozone depletion and economic risks of \
regulations. This formulation is consistent with Kingdon's (2003) problem
\
stream description. This formulation is based on Sterman's (1985) model
of \
Kuhn's theory of knowledge development except funding is used as the \
resource applied to knowledge development rather then practitioners.
|

funding for ODS replacement technology development=
ODS replacement technology funding per hour of policy maker attention*total annual attention of policy makers to ozone issues
~ million $
~ The total amount of annual funding for technology development increases
\
with increased unit funding and increased policy maker attention to the \
cancer risks from ozone depletion and economic risks of regulations. This
\
formulation is consistent with Kingdon's (2003) problem stream \
description. This formulation is based on Sterman's (1985) model of
Kuhn's \
theory of knowledge development except funding is used as the resource \
applied to technology development rather then practitioners. This \
formulation also assumes that technology development follows Kuhn's
theory \
of knowledge development.
|

funding for atmospheric science research=

science funding per hour of policy maker attention*total annual attention of policy makers to ozone issues
~ million $
~ The total amount of annual funding for atmospheric science research \
increases with increased unit funding and increased policy maker attention \
to the cancer risks from ozone depletion and economic risks of \
regulations. This formulation is consistent with Kingdon's (2003) problem \
stream description. This formulation is based on Sterman's (1985) model of \
Kuhn's theory of knowledge development except funding is used as the \
resource applied to knowledge development rather then practitioners.
|

"Total stratospheric ozone (actual)"= INTEG (
+production of stratospheric ozone-destruction of stratospheric ozone,
average initial steady state stratospheric ozone)
~ trillion molecules
~ The total amount of stratosphereic distributed across the globe increase \
through the production of ozone and decreases through the destruction of \
ozone.
|

"% of CFC-12 transported to the stratosphere"=
1
~ Dmnl
~ According to Figure 5 of the Evironmental Health Criteria-166 "Methyl \
Bromide" published by the International Program on Chemical Safety CFC-12 \
is not removed in the troposphere so 100% of the molecules are transported \
to the stratosphere. Document available at \
http://www.inchem.org/documents/ehc/ehc/ehc166.htm
|

number of stratospheric ozone molecules destroyed by one Cl atom in a year=
50
~ trillion molecules/trillion atoms
~ The number of molecules of ozone destroyed by one molecule of CFC-11 in a \
year. Question 9 of Fahey, D. 2006. "Twenty questions and answers about \
the ozone layer: 2006 update." Panel Review Meeting for the 2006 Ozone \
Assessment. Les Diablerets, Switzerland, June 19-23 states that "a single \

chlorine atom can destroy hundreds of ozone molecules." The actual number \
was be used to calibrate the model.
|

"transport of CFC-12 to the stratosphere"=
("% of CFC-12 transported to the stratosphere"*"CFC-12 in the troposphere")/time for ODS to move from the troposhere to the stratosphere
~ trillion molecules/Year
~ Describes the movement of molecules from the troposphere to the \
stratosphere due to wind currents, convection, and other atmospheric \
transport processes.
|

time for ODS to move from the troposhere to the stratosphere=
4
~ Year
~ Dessler notes in 'The chemistry and physics of stratospheric ozone" that \
the lag in chlorine concentrations between the troposphere and the \
stratosphere is 3-5 years (p. 63). Based on this, I assume a value of 4 \
years and that the constant is universal for all ODS.
|

"removal of CFC-12 from the troposphere"=
((1-"% of CFC-12 transported to the stratosphere")*"CFC-12 in the troposphere")/"time to remove CFC-12 from the troposphere"
~ trillion molecules/Year
~ The number of molecules that are removed in the troposphere due to natural \
sinks and chemical reactions.
|

"time to remove CFC-12 from the troposphere"=
4
~ Year
~ Assumed equal to the time to transport ODS from the troposphere to the \
stratosphere.
|

"CFC-12 atmospheric lifetime"=
100
~ Year
~ The atmospheric lifetime of CFC-12. From Table Q7-1 in Fahey, D. 2006. \
"Twenty questions and answers about the ozone layer: 2006 update." Panel \

Review Meeting for the 2006 Ozone Assessment. Les Diablerets, Switzerland, \
June 19-23.
|

political willingness to adjust ODS emission policy gap=
indicated political willingness to adjust ODS emissions policy-Political willingness to adjust ODS emission policy
~ Dmnl
~ The difference between the current political willingness to adjust ODS \
policy and the indicated willingness to adjust policy.
|

change in political willingness to adjust ODS emission policy=
political willingness to adjust ODS emission policy gap/time required to change political willingness to adjust ODS emission policy
~ Dmnl/Year
~ The change in the % political support for ODS regulation.
|

Political willingness to adjust ODS emission policy= INTEG (
+change in political willingness to adjust ODS emission policy,
0)
~ Dmnl
~ The willingness of politicians to adjust the current level of ODS \
emissions. A value of 1 indicates that the political environment is such \
that policy adjustment are completely flexible. A value of 0 indicates \
that the political environment is such that no policy adjustments are \
possible.
|

decrease annual policy maker attention to ODS regulation risks=
"% yearly errosion of policy maker attention"*Annual attention of policy makers to economic risks of ODS regulation
~ hours/(Year*Year)
~ The errosion of policy maker attention per year. This formulation is based \
on Kingdon's (2003) problem stream.
|

sensitivity of policy maker attention to atmospheric science knowledge=
500
~ hour/(Dmnl*Year)
~ The sensitivity of policy makers to atmospheric science knowledge \
concerning ozone depletion.
|

time required to change political willingness to adjust ODS emission policy=
1
~ Year
~ The time over which political willingness to adjust policy changes.
|

relative attention fraction of policy makers to ozone related cancer risks=
ZIDZ(Annual attention of policy makers to ozone related cancer risks,(Annual attention of policy makers to economic risks of ODS regulation\
+Annual attention of policy makers to ozone related cancer risks
))
~ Dmnl
~ The policy maker willingness to regulate ODS production and use. Increases \
as the attention of policy makers to ozone related cancer risks increases \
and decreases as the attention of policy makers to economic risks of ODS \
regulation increases. The more attention paid to ozone related cancer \
risks, the faster emission reductions are put in place. This formulation \
is based on Kingdon's (2003) problem stream.
|

effectiveness of domain experts in communicating with society=
0.5
~ Dmnl/Year
~ The ability of domain experts to communicate their knowledge and opinions \
to society affects the rate at which socity's risk perception from \
stratospheric ozone depletion adjusts to scientist risk perception from \
stratospheric ozone depletion. This describes the feedback communication \
channels in Kasperson et al's risk amplification framework.
|

maximum percentage of total policy maker attention that can be devoted to ozone related cancer risks\
=
0.5
~ Dmnl
~ The maximum % of policy maker attention to ozone issues that can be \
devoted to cancer risks.
|

"% of atmospheric science puzzles resolved"=
1-(Unresolved ozone related atmospheric science puzzles/initial unresolved ozone related atmospheric science puzzles\

)
~ Dmnl
~ Reflects the level of knowledge developed. A higher percentage indicates a \
greater level of knowledge.
|

time required to raise policy maker attention to maximum level=
1
~ Year
~ The time required to raise policy maker attention to the maximum allowable \
level.
|

maximum percentage of total policy maker attention that can be devoted to ODS regulation risks\
=
1-maximum percentage of total policy maker attention that can be devoted to ozone related cancer risks
~ Dmnl
~ The maximum % of policy maker attention to ozone issues that can be \
devoted to economic risks of regulation.
|

Society's perception of percent increased skin cancer risks due to ozone depletion= INTEG\
(
change in society's ozone depletion related skin cancer risk perception,
"society's initial perception of % increased skin cancer risks from ozone depletion"\
)
~ Dmnl
~ Socity's perception of increased skin cancer risks associated with \
stratospheric ozone depletion. This value adjusts to the scientific \
estimation of risk over time.
|

"% of attention available to ozone issues"=
0.3
~ Dmnl
~ The % of the maximum attention hours that can be allocated to ozone issues.
|

"% of ODS replacement engineering puzzles resolved"=

1-(Unresolved ODS replacement engineering puzzles/initial unresolved ODS replacement engineering puzzles\
)
~ Dmnl
~ Reflects the level of knowledge developed. A higher percentage indicates a \
greater level of knowledge.
|

initial unresolved ODS replacement engineering puzzles=
10000
~ puzzles
~ The initial number of unsolved engineering puzzles.
|

policy maker annual hours available for attention=
2080
~ hours/Year
~ The maximum number of policy maker hours in a year. Assumes that there are \
40 available hours in a week, 52 weeks a year for a total of 2080 hours.
|

sensitivity of policy maker attention to society's ozone related cancer concerns=
1000
~ hours/(Dmnl*Year)
~ The unit increase in policy makers' attention to stratospheric ozone \
depletion for an increase in society's risk perception of cancer risks \
from ozone depletion. This formulation is based on Kingdon's (2003) \
problem stream.
|

time required to increase policy maker attention to ozone related cancer concerns=
5
~ Year
~ The time required to increase policy maker attention to ozone related \
cancer concerns.
|

Unresolved ozone related atmospheric science puzzles= INTEG (
-development of atmospheric science knowledge,
initial unresolved ozone related atmospheric science puzzles-1000)
~ puzzles
~ The number of puzzles related to stratospheric ozone science that remain \
unresolved. This formulation is based on Sterman's (1985) model of Kuhn's \

theory of knowledge development.
|

Unresolved ODS replacement engineering puzzles= INTEG (
-development of chemical engineering knowledge,
initial unresolved ODS replacement engineering puzzles)
~ puzzles
~ The number of nuclear engineering puzzles remaining to be solved.
|

maximum annual attention available for ozone issues=
"% of attention available to ozone issues"*policy maker annual hours available for attention
~ hours/Year
~ The total amount of policy maker attention available for statospheric \
ozone depletion. Other issues (economics, social, wars, etc.) can limited \
the amount of attention available for ozone issues. This formulation is \
based on Kingdon's (2003) problem stream.
|

initial unresolved ozone related atmospheric science puzzles=
10000
~ puzzles
~ The initial number of unsolved science puzzles.
|

engineering funding per hour of policy maker attention=
100
~ million $/(hour/Year)
~ Annual unit funding for engineering knowledge development per hour of \
policy maker attention to a problem. This unit funding includes both \
public and private money applied to knowledge development
|

"% of chemical engineering puzzles solved per dollar of funding"=
5e-005
~ Dmnl/million $
~ The percentage of puzzles solved per dollar of funding. Reflects the \
difficulty level of puzzles to be solved.
|

science funding per hour of policy maker attention=
100
~ million $/(hour/Year)
~ Annual unit funding for science knowledge development per hour of policy \

maker attention to a problem. This unit funding includes both public and \
private money applied to knowledge development
|

ODS replacement technology funding per hour of policy maker attention=
100
~ million $/(hour/Year)
~ Annual unit funding for technology development per hour of policy maker
\
attention to a problem. This unit funding includes both public and private \
money applied to knowledge development
|

time to develop technology=
5
~ Year
~ The time required to develop ODS replacement technology.
|

time to develop chemical engineering knowledge=
5
~ Year
~ The time required to develop engineering knowledge.
|

"% of atmospheric science puzzles solved per dollar of funding"=
5e-005
~ Dmnl/million $
~ The percentage of puzzles solved per dollar of funding. Reflects the \
difficulty level of puzzles to be solved.
|

"% yearly errosion of policy maker attention"=
0.1
~ Dmnl/Year
~ The percent errosion of policy maker attention to an issue per year.
|

Annual attention of policy makers to economic risks of ODS regulation= INTEG (
increase annual policy maker attention to ODS regulation risks-decrease annual
policy maker attention to ODS regulation risks\
,
0)
~ hours/Year
~ The attention of policy makers to the risks of regulating ODS emissions.
|

Annual attention of policy makers to ozone related cancer risks= INTEG (
increase policy maker annual attention to ozone related cancer concerns-decrease policy maker annual attention to ozone related cancer risks\
,
0)
~ hours/Year
~ The attention of policy makers to cancer risks posed by stratospheric \
ozone depletion.
|

total annual attention of policy makers to ozone issues=
Annual attention of policy makers to economic risks of ODS regulation+Annual attention of policy makers to ozone related cancer risks
~ hours/Year
~ The total attention policy makers pay to both sides of the ozone issue. \
This drives the amount of funding applied to SET development and is based \
on Kingdon's (2003) problem stream framework.
|

****
.Control
**~
Simulation Control Parameters
|

FINAL TIME = 2005
~ Year
~ The final time for the simulation.
|

INITIAL TIME = 1920
~ Year
~ The initial time for the simulation.
|

SAVEPER = 1
~ Year
~ The frequency with which output is stored.
|

TIME STEP = 0.0625
~ Year
~ The time step for the simulation.
|

\\\---/// Sketch information - do not modify anything except names
V300 Do not put anything below this section - it will be ignored
*Policy Sector
$192-192-192,0,Times New Roman|12||0-0-0|0-0-0|0-0-255|-1--1--1|-1--1--1|96,96
10,1,Annual attention of policy makers to ozone related cancer
risks,1112,294,77,43,3,3,0,0,0,0,0,0
10,2,Annual attention of policy makers to economic risks of ODS
regulation,1124,1009,101,45,3,3,0,0,0,0,0,0
12,3,48,821,287,10,8,0,3,0,0,-1,0,0,0
1,4,6,1,4,0,0,22,0,0,0,-1--1--1,,1|(983,288)|
1,5,6,3,100,0,0,22,0,0,0,-1--1--1,,1|(875,288)|
11,6,48,925,288,6,8,34,3,0,0,1,0,0,0
10,7,increase policy maker annual attention to ozone related cancer
concerns,925,333,91,28,40,3,0,0,-1,0,0,0
12,8,48,1408,295,10,8,0,3,0,0,-1,0,0,0
1,9,11,8,4,0,0,22,0,0,0,-1--1--1,,1|(1350,291)|
1,10,11,1,100,0,0,22,0,0,0,-1--1--1,,1|(1239,291)|
11,11,48,1296,291,6,8,34,3,0,0,1,0,0,0
10,12,decrease policy maker annual attention to ozone related cancer
risks,1296,333,94,28,40,3,0,0,-1,0,0,0
12,13,48,825,1005,10,8,0,3,0,0,-1,0,0,0
1,14,16,2,4,0,0,22,0,0,0,-1--1--1,,1|(971,1003)|
1,15,16,13,100,0,0,22,0,0,0,-1--1--1,,1|(871,1003)|
11,16,48,914,1003,6,8,34,3,0,0,1,0,0,0
10,17,increase annual policy maker attention to ODS regulation
risks,914,1047,91,28,40,3,0,0,-1,0,0,0
12,18,48,1409,1006,10,8,0,3,0,0,-1,0,0,0
1,19,21,18,4,0,0,22,0,0,0,-1--1--1,,1|(1357,1006)|
1,20,21,2,100,0,0,22,0,0,0,-1--1--1,,1|(1264,1006)|
11,21,48,1310,1006,6,8,34,3,0,0,1,0,0,0
10,22,decrease annual policy maker attention to ODS regulation
risks,1310,1047,77,28,40,3,0,0,-1,0,0,0
10,23,maximum annual attention available for ozone issues,334,722,81,27,8,3,0,0,0,0,0,0
10,24,total annual attention of policy makers to ozone
issues,1262,666,77,27,8,3,0,0,0,0,0,0
1,25,1,24,1,0,43,0,2,64,0,-1--1--1,|12||0-0-0,1|(1239,581)|
1,26,2,24,1,0,43,0,2,64,0,-1--1--1,|12||0-0-0,1|(1194,907)|
10,27,relative attention fraction of policy makers to ozone related cancer
risks,1700,698,97,28,8,3,0,0,0,0,0,0
10,28,"% yearly errosion of policy maker attention",1435,673,70,19,8,3,0,0,0,0,0,0
1,29,1,12,1,0,43,0,2,192,0,-1--1--1,|14||255-0-0,1|(1201,370)|
1,30,2,21,1,0,43,0,2,192,0,-1--1--1,|14||255-0-0,1|(1217,949)|
1,31,28,12,1,0,43,0,2,192,0,-1--1--1,|14||255-0-0,1|(1413,489)|
1,32,28,21,1,0,43,0,2,64,0,-1--1--1,|14||255-0-0,1|(1416,907)|

10,33,sensitivity of policy maker attention to society's ozone related cancer concerns,581,-53,85,28,8,3,0,0,0,0,0,0
10,34,time required to increase policy maker attention to ozone related cancer concerns,574,359,102,28,8,3,0,0,0,0,0,0
1,35,34,7,1,0,45,0,2,192,0,-1--1--1,|14||255-0-0,1|(733,375)|
10,36,policy maker annual hours available for attention,154,589,81,28,8,3,0,0,0,0,0,0
10,37,"% of attention available to ozone issues",162,789,74,19,8,3,0,0,0,0,0,0
1,38,36,23,1,0,43,0,2,64,0,-1--1--1,|14||255-0-0,1|(219,669)|
1,39,37,23,1,0,43,0,2,192,0,-1--1--1,|14||255-0-0,1|(253,770)|
10,40,maximum percentage of total policy maker attention that can be devoted to ozone related cancer risks,660,638,114,28,8,3,0,0,0,0,0,0
10,41,maximum percentage of total policy maker attention that can be devoted to ODS regulation risks,679,772,114,28,8,3,0,0,0,0,0,0
10,42,Society's perception of percent increased skin cancer risks due to ozone depletion,407,184,87,41,8,2,0,19,-1,0,0,0,128-128-128,0-0-0,|12|B|255-0-0
1,43,1,27,1,0,43,0,2,192,0,-1--1--1,|12||255-0-0,1|(1412,263)|
1,44,2,27,1,0,45,0,2,64,0,-1--1--1,|12||255-0-0,1|(1552,1049)|
10,45,maximum annual policy maker attention to ozone related cancer risks,658,490,95,28,8,3,0,0,0,0,0,0
1,46,40,45,1,0,43,0,2,192,0,-1--1--1,|12||255-0-0,1|(614,564)|
10,47,maximum annual policy maker attention to ODS regulation economic risks,693,905,95,28,8,3,0,0,0,0,0,0
1,48,41,47,1,0,43,0,2,192,0,-1--1--1,|12||255-0-0,1|(660,842)|
1,49,45,7,1,0,43,0,2,64,0,-1--1--1,|12||255-0-0,1|(837,397)|
10,50,time required to raise policy maker attention to maximum level,1057,659,90,28,8,3,0,0,0,0,0,0
1,51,50,7,1,0,45,0,2,64,0,-1--1--1,|12||255-0-0,1|(968,501)|
1,52,1,7,1,0,45,0,2,192,0,-1--1--1,|12||255-0-0,1|(1026,377)|
1,53,40,41,1,0,45,0,2,64,0,-1--1--1,|12||255-0-0,1|(701,703)|
1,54,50,16,1,0,45,0,2,64,0,-1--1--1,|12||255-0-0,1|(949,817)|
1,55,2,16,1,0,45,0,2,64,0,-1--1--1,|12||255-0-0,1|(1056,956)|
1,56,47,17,1,0,43,0,2,192,0,-1--1--1,|12||255-0-0,1|(766,1018)|
10,57,sensitivity of policy maker attention to atmospheric science knowledge,1167,-32,94,28,8,3,0,0,0,0,0,0
10,58,Society's perception of percent increased skin cancer risks due to ozone depletion,1528,-80,95,28,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
10,59,Political willingness to adjust ODS emission policy,2217,211,78,43,3,3,0,0,0,0,0,0
12,60,48,1890,213,10,8,0,3,0,0,-1,0,0,0
1,61,63,59,4,0,0,22,0,0,0,-1--1--1,,1|(2079,210)|
1,62,63,60,100,0,0,22,0,0,0,-1--1--1,,1|(1954,210)|
11,63,48,2014,210,6,8,34,3,0,0,1,0,0,0
10,64,change in political willingness to adjust ODS emission policy,2014,255,91,28,40,3,0,0,-1,0,0,0
10,65,time required to change political willingness to adjust ODS emission policy,1880,367,100,28,8,3,0,0,0,0,0,0
1,66,65,64,1,0,45,0,2,192,0,-1--1--1,|12||128-128-128,1|(1978,338)|

10,67,political willingness to adjust ODS emission policy gap,2051,61,68,28,8,3,0,0,0,0,0,0
1,68,59,67,1,0,45,0,2,192,0,-1--1--1,|12||128-128-128,1|(2179,99)|
1,69,67,63,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(1974,135)|
10,70,indicated political willingness to adjust ODS emissions policy,1842,-24,90,28,8,3,0,0,0,0,0,0
1,71,70,67,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1989,-14)|
1,72,23,45,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(518,533)|
1,73,23,47,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(509,860)|
10,74,increase of policy maker attention to ozone related cancer concerns due to societal pressure,673,121,106,28,8,3,0,0,0,0,0,0
1,75,74,6,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(825,243)|
10,76,increase of policy maker attention to ozone reated cancer risks due to scientific knowledge,1031,115,111,28,8,3,0,0,0,0,0,0
1,77,76,6,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(983,239)|
1,78,33,74,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(650,45)|
1,79,42,74,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(551,199)|
1,80,57,76,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(1129,50)|
10,81,"amount of pro-ODS regulation influence",1952,-203,73,19,8,3,0,0,0,0,0,0
1,82,81,70,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(1846,-127)|
10,83,"% of ODS replacement technology puzzles solved",1835,149,80,28,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
1,84,83,70,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1867,67)|
10,85,"% of ODS replacement technology puzzles solved",1085,1171,80,28,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
1,86,7,16,1,0,0,0,0,64,0,-1--1--1,,1|(846,868)|
1,87,85,17,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(958,1126)|
1,88,58,70,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1671,-30)|
10,89,politician's sensitivity to society's risk perception,1675,-175,77,19,8,3,0,0,0,0,0,0
10,90,politician's sensitivity to ODS replacement technology availability,1627,75,92,28,8,3,0,0,0,0,0,0
1,91,89,70,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(1725,-87)|
1,92,90,70,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(1776,32)|
10,93,policy maker's perceived economic risk of regulation,752,1172,72,28,8,3,0,0,0,0,0,0
1,94,93,17,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(856,1128)|
10,95,"% of atmospheric science puzzles resolved",1031,162,61,28,8,2,1,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
10,96,scientists' estimation of the percent increased skin cancer risk from stratospheric ozone depletion,944,-30,114,28,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
1,97,96,76,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(954,41)|
10,98,politicians sensitivity to interest groups,2106,-114,72,19,8,3,0,0,0,0,0,0
1,99,98,70,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1950,-89)|
\\\---/// Sketch information - do not modify anything except names
V300 Do not put anything below this section - it will be ignored
*Science & Technology Sector

$192-192-192,0,Times New Roman|12||0-0-0|0-0-0|0-0-255|-1--1--1|-1--1--1|96,96
10,1,Unresolved ODS replacement engineering puzzles,1011,356,72,44,3,3,0,0,0,0,0,0
10,2,Unresolved ODS replacement technology puzzles,1277,798,68,43,3,3,0,0,0,0,0,0
10,3,total annual attention of policy makers to ozone issues,262,583,82,27,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
10,4,funding for atmospheric science research,245,88,74,19,8,3,0,0,0,0,0,0
10,5,funding for chemical engineering knowledge research,481,401,72,28,8,3,0,0,0,0,0,0
10,6,funding for ODS replacement technology development,663,821,75,28,8,3,0,0,0,0,0,0
10,7,science funding per hour of policy maker attention,138,-3,79,19,8,3,0,0,0,0,0,0
10,8,engineering funding per hour of policy maker attention,365,300,73,28,8,3,0,0,0,0,0,0
10,9,ODS replacement technology funding per hour of policy maker attention,689,691,94,28,8,3,0,0,0,0,0,0
1,10,3,4,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(167,345)|
1,11,3,5,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(426,492)|
1,12,3,6,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(387,705)|
1,13,7,4,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(236,25)|
1,14,8,5,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(480,328)|
1,15,9,6,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(706,772)|
10,16,"% of atmospheric science puzzles solved per dollar of funding",595,71,86,28,8,3,0,0,0,0,0,0
10,17,"% of chemical engineering puzzles solved per dollar of funding",759,539,86,28,8,3,0,0,0,0,0,0
10,18,time to develop atmospheric science knowledge,846,-210,64,28,8,3,0,0,0,0,0,0
10,19,time to develop chemical engineering knowledge,789,237,79,19,8,3,0,0,0,0,0,0
10,20,time to develop technology,927,664,49,19,8,3,0,0,0,0,0,0
10,21,Unresolved ozone related atmospheric science puzzles,896,-76,70,38,3,3,0,0,0,0,0,0
12,22,48,576,-77,10,8,0,3,0,0,-1,0,0,0
1,23,25,22,4,0,0,22,0,0,0,-1--1--1,,1|(643,-77)|
1,24,25,21,100,0,0,22,0,0,0,-1--1--1,,1|(769,-77)|
11,25,48,706,-77,6,8,34,3,0,0,1,0,0,0
10,26,development of atmospheric science knowledge,706,-33,64,36,40,3,0,0,-1,0,0,0
1,27,21,26,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(802,28)|
1,28,4,26,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(431,-6)|
1,29,18,25,1,0,45,0,2,64,0,-1--1--1,|12||128-128-128,1|(786,-128)|
1,30,16,26,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(619,-1)|
12,31,48,684,353,10,8,0,3,0,0,-1,0,0,0
1,32,34,31,4,0,0,22,0,0,0,-1--1--1,,1|(752,353)|
1,33,34,1,100,0,0,22,0,0,0,-1--1--1,,1|(880,353)|
11,34,48,816,353,6,8,34,3,0,0,1,0,0,0
10,35,development of chemical engineering knowledge,816,380,79,19,40,3,0,0,-1,0,0,0
1,36,1,35,1,0,0,0,0,64,0,-1--1--1,,1|(896,432)|
1,37,5,35,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(631,419)|
1,38,17,35,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(757,469)|

1,39,19,34,1,0,45,0,2,64,0,-1--1--1,|12||128-128-128,1|(773,284)|
10,40,initial unresolved ozone related atmospheric science puzzles,1076,-
71,87,28,8,3,0,0,0,0,0,0
10,41,initial unresolved ODS replacement engineering
puzzles,1186,352,76,28,8,3,0,0,0,0,0,0
10,42,"% of ODS replacement engineering puzzles
resolved",1085,491,75,28,8,3,0,0,0,0,0,0
1,43,41,42,1,0,45,0,2,64,0,-1--1--1,|12||128-128-128,1|(1161,455)|
1,44,1,42,1,0,45,0,2,192,0,-1--1--1,|12||128-128-128,1|(1015,447)|
10,45,"% of atmospheric science puzzles resolved",997,36,77,19,8,3,0,0,0,0,0,0
1,46,21,45,1,0,0,0,0,64,0,-1--1--1,,1|(920,0)|
1,47,40,45,1,0,45,0,2,192,0,-1--1--1,|12||128-128-128,1|(1076,7)|
10,48,initial unresolved ODS replacement technology
puzzles,1474,804,75,28,8,3,0,0,0,0,0,0
10,49,"% of ODS replacement technology puzzles solved per dollar of
funding",977,954,94,28,8,3,0,0,0,0,0,0
12,50,48,915,797,10,8,0,3,0,0,-1,0,0,0
1,51,53,50,4,0,0,22,0,0,0,-1--1--1,,1|(994,797)|
1,52,53,2,100,0,0,22,0,0,0,-1--1--1,,1|(1142,797)|
11,53,48,1070,797,6,8,34,3,0,0,1,0,0,0
10,54,development of ODS replace technology,1070,824,68,19,40,3,0,0,-1,0,0,0
1,55,42,53,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(1138,668)|
10,56,"% of ODS replacement technology puzzles solved",1383,929,82,19,8,3,0,0,0,0,0,0
1,57,2,56,1,0,45,0,2,192,0,-1--1--1,|12||128-128-128,1|(1275,889)|
1,58,48,56,1,0,45,0,2,192,0,-1--1--1,|12||128-128-128,1|(1481,892)|
1,59,2,54,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1180,874)|
1,60,6,54,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(837,865)|
1,61,20,53,1,0,45,0,2,64,0,-1--1--1,|12||128-128-128,1|(1017,768)|
1,62,49,54,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(1038,893)|
1,63,45,34,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(931,232)|
10,64,"% change in global total stratospheric ozone from baseline value (absolute)",694,-
315,85,39,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
10,65,average time required to develop atmospheric science knowledge,1009,-
314,91,28,8,3,0,0,0,0,0,0
1,66,65,18,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(966,-239)|
1,67,64,18,1,0,45,0,2,64,0,-1--1--1,|12||128-128-128,1|(742,-235)|
1,68,41,1,0,0,0,0,0,0,1,-1--1--1,,1|(1103,353)|
1,69,48,2,0,0,0,0,0,0,1,-1--1--1,,1|(1378,801)|
1,70,40,21,0,0,0,0,0,0,1,-1--1--1,,1|(984,-74)|
\\\---/// Sketch information - do not modify anything except names
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*Society's Risk Perception
$192-192-192,0,Times New Roman|12||0-0-0|0-0-0|0-0-255|-1--1--1|-1--1--1|96,96
10,1,Society's perception of percent increased skin cancer risks due to ozone
depletion,984,685,87,51,3,3,0,0,0,0,0,0
12,2,48,646,678,10,8,0,3,0,0,-1,0,0,0

1,3,5,1,4,0,0,22,0,0,0,-1--1--1,,1|(843,678)|
1,4,5,2,100,0,0,22,0,0,0,-1--1--1,,1|(716,678)|
11,5,48,783,678,6,8,34,3,0,0,1,0,0,0
10,6,change in society's ozone depletion related skin cancer risk
perception,783,726,92,40,40,3,0,0,-1,0,0,0
10,7,"% of atmospheric science puzzles resolved",158,593,78,25,8,2,0,3,-1,0,0,0,128-
128-128,0-0-0,|12||128-128-128
10,8,confidence of society in stratospheric ozone
knowledge,301,485,74,28,8,3,0,0,0,0,0,0
10,9,effectiveness of domain experts in communicating with
society,552,824,80,28,8,3,0,0,0,0,0,0
10,10,"society's initial perception of % increased skin cancer risks from ozone
depletion",1182,687,102,28,8,3,0,0,0,0,0,0
10,11,"Scientists' estimation of the % decrease in stratospheric
ozone",472,108,77,28,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
10,12,scientists' estimation of the percent increased skin cancer risk from stratospheric
ozone depletion,597,261,109,28,8,3,0,0,0,0,0,0
1,13,11,12,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(483,198)|
10,14,"% increase in skin cancer per % decrease in stratospheric
ozone",728,153,93,28,8,3,0,0,0,0,0,0
1,15,14,12,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(717,230)|
10,16,difference between society's risk perception and scientist's risk
perception,860,526,93,28,8,3,0,0,0,0,0,0
1,17,1,16,1,0,45,0,2,192,0,-1--1--1,|12||128-128-128,1|(985,578)|
1,18,16,5,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(768,580)|
10,19,society's trust in scientists,220,333,50,19,8,3,0,0,0,0,0,0
1,20,19,8,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(271,382)|
10,21,society's perception of percent increased skin cancer risks from stratospheric ozone
depletion based upon science,595,456,114,38,8,3,0,0,0,0,0,0
1,22,8,21,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(456,528)|
1,23,12,21,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(561,372)|
1,24,9,6,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(706,813)|
1,25,21,16,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(760,449)|
10,26,amplification risk factor for stratospheric ozone
depletion,942,350,85,28,8,3,0,0,0,0,0,0
1,27,26,21,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(713,373)|
1,28,7,8,1,0,0,0,0,64,0,-1--1--1,,1|(268,561)|
1,29,10,1,0,0,0,0,0,0,1,-1--1--1,,1|(1082,686)|
\\\---/// Sketch information - do not modify anything except names
V300 Do not put anything below this section - it will be ignored
*Stratospheric Ozone
$192-192-192,0,Times New Roman|12||0-0-0|0-0-0|0-0-255|-1--1--1|-1--1--1|96,96
10,1,"Total stratospheric ozone (actual)",1529,212,76,47,3,3,0,0,0,0,0,0
12,2,48,1843,214,10,8,0,3,0,0,-1,0,0,0
1,3,5,1,4,0,0,22,0,0,0,-1--1--1,,1|(1659,214)|
1,4,5,2,100,0,0,22,0,0,0,-1--1--1,,1|(1779,214)|

11,5,48,1719,214,6,8,34,3,0,0,1,0,0,0
10,6,production of stratospheric ozone,1719,259,62,19,40,3,0,0,-1,0,0,0
12,7,48,1235,212,10,8,0,3,0,0,-1,0,0,0
1,8,10,7,4,0,0,22,0,0,0,-1--1--1,,1|(1294,212)|
1,9,10,1,100,0,0,22,0,0,0,-1--1--1,,1|(1404,212)|
11,10,48,1349,212,6,8,34,3,0,0,1,0,0,0
10,11,destruction of stratospheric ozone,1349,239,62,19,40,3,0,0,-1,0,0,0
10,12,"amount of ozone that can be destroyed by Cl from CFC-12",1758,-
186,98,26,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
10,13,amount of stratospheric ozone that can be destroyed by available anthropogenic Cl
and Br,1307,-178,109,28,8,3,0,0,0,0,0,0
1,14,12,13,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1512,-238)|
10,15,average initial steady state stratospheric ozone,1296,419,79,19,8,3,0,0,0,0,0,0
10,16,"% change in global total stratospheric ozone from baseline value
(absolute)",1455,499,79,28,8,3,0,0,0,0,0,0
1,17,15,16,1,0,45,0,2,192,0,-1--1--1,|12||128-128-128,1|(1407,429)|
1,18,1,16,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(1503,413)|
10,19,"Scientists' estimation of the % decrease in stratospheric
ozone",942,668,83,48,3,3,0,0,0,0,0,0
12,20,48,1262,670,10,8,0,3,0,0,-1,0,0,0
1,21,23,19,4,0,0,22,0,0,0,-1--1--1,,1|(1085,670)|
1,22,23,20,100,0,0,22,0,0,0,-1--1--1,,1|(1204,670)|
11,23,48,1151,670,6,8,34,3,0,0,1,0,0,0
10,24,"adjustment in scientists' estimation of the % change in stratospheric
ozone",1151,711,92,28,40,3,0,0,-1,0,0,0
10,25,"gap in estimation of % decrease in stratospheric
ozone",1122,534,79,28,8,3,0,0,0,0,0,0
1,26,16,25,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1291,568)|
1,27,19,25,1,0,45,0,2,192,0,-1--1--1,|12||128-128-128,1|(962,569)|
1,28,25,23,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(1162,603)|
10,29,"% of atmospheric science puzzles resolved",1333,861,61,28,8,2,0,3,-1,0,0,0,128-
128-128,0-0-0,|12||128-128-128
1,30,29,24,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(1219,818)|
10,31,amount of ozone that can be destroyed by Cl from CCl4,1702,-315,97,28,8,2,0,3,-
1,0,0,0,128-128-128,0-0-0,|12||128-128-128
10,32,"amount of ozone that can be destroyed by Cl from CFC-11",1537,-
430,100,30,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
10,33,"amount of ozone that can be destroyed by Cl from CFC-113",1284,-
485,84,28,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
10,34,amount of ozone that can be destroyed by Cl from CH3CCl3,1069,-
490,84,28,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
10,35,"amount of ozone that can be destroyed by Br and Cl from halon-1211",883,-
436,84,28,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
10,36,"amount of ozone that can be destroyed by Br from halon-1301",770,-
286,84,28,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128

10,37,"amount of ozone that can be destroyed by Cl from HCFC-22",842,-
141,102,29,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
10,38,amount of ozone that can be destroyed by Br from anthropogenic methyl
bromide,950,-30,98,39,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
1,39,31,13,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1444,-292)|
1,40,32,13,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1313,-295)|
1,41,33,13,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1218,-311)|
1,42,34,13,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1141,-277)|
1,43,35,13,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1037,-250)|
1,44,36,13,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(990,-171)|
1,45,37,13,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1076,-98)|
1,46,38,13,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1189,-55)|
10,47,min time to destroy ozone,1060,81,45,19,8,3,0,0,0,0,0,0
10,48,time to adjust scientist's estimation of the decrease in stratospheric
ozone,1045,845,90,28,8,3,0,0,0,0,0,0
1,49,48,24,1,0,45,0,2,192,0,-1--1--1,|12||128-128-128,1|(1050,769)|
10,50,"% change in total stratospheric ozone from baseline
value",1466,654,79,28,8,3,0,0,0,0,0,0
1,51,16,50,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1429,576)|
10,52,Reactive Cl in the stratosphere due to CCl4,348,-241,61,28,8,2,0,3,-1,0,0,0,128-
128-128,0-0-0,|12||128-128-128
10,53,"Reactive Cl in the stratosphere due to CFC-11",179,-169,61,28,8,2,0,3,-
1,0,0,0,128-128-128,0-0-0,|12||128-128-128
10,54,"Reactive Cl in the stratosphere due to CFC-113",525,-121,61,28,8,2,0,3,-
1,0,0,0,128-128-128,0-0-0,|12||128-128-128
10,55,"Reactive Cl in the stratosphere due to CFC-12",538,35,61,28,8,2,0,3,-1,0,0,0,128-
128-128,0-0-0,|12||128-128-128
10,56,Reactive Cl in the stratosphere due to CH3CCl3,425,206,61,28,8,2,0,3,-
1,0,0,0,128-128-128,0-0-0,|12||128-128-128
10,57,"Reactive Cl in the stratosphere due to halon-1211",129,4,61,28,8,2,0,3,-
1,0,0,0,128-128-128,0-0-0,|12||128-128-128
10,58,"Reactive Cl in the stratosphere due to HCFC-22",176,170,61,28,8,2,0,3,-
1,0,0,0,128-128-128,0-0-0,|12||128-128-128
10,59,Reactive Cl in the stratosphere,338,-13,56,19,8,3,0,0,0,0,0,0
1,60,53,59,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(228,-62)|
1,61,57,59,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(259,16)|
1,62,58,59,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(302,80)|
1,63,56,59,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(406,55)|
1,64,55,59,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(455,-5)|
1,65,54,59,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(398,-68)|
1,66,52,59,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(314,-60)|
10,67,natural production rate of stratospheric ozone,1785,52,72,19,8,3,0,0,0,0,0,0
1,68,67,5,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(1748,181)|
10,69,natural ozone destruction rate constant,1626,9,49,28,8,3,0,0,0,0,0,0
1,70,67,69,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(1706,13)|

10,71,average initial steady state stratospheric ozone,1658,-104,70,28,8,2,0,3,-
1,0,0,0,128-128-128,0-0-0,|12||128-128-128
1,72,71,69,1,0,45,0,2,64,0,-1--1--1,|12||128-128-128,1|(1581,-68)|
10,73,natural anthropogenic stratospheric ozone destruction
rate,1467,60,68,28,8,3,0,0,0,0,0,0
1,74,69,73,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1512,8)|
1,75,1,73,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(1533,125)|
1,76,73,10,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(1422,146)|
10,77,anthropogenic stratospheric ozone destruction rate,1277,54,62,28,8,3,0,0,0,0,0,0
1,78,13,77,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(1337,-71)|
1,79,47,77,1,0,45,0,2,192,0,-1--1--1,|12||128-128-128,1|(1138,39)|
1,80,77,10,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(1297,165)|
1,81,1,77,1,0,0,0,0,64,0,-1--1--1,,1|(1373,83)|
10,82,production of stratospheric ozone,1101,200,67,19,8,2,0,3,-1,0,0,0,128-128-128,0-
0-0,|12||128-128-128
1,83,82,77,1,0,0,0,0,64,0,-1--1--1,,1|(1151,106)|
1,84,15,1,0,0,0,0,0,0,1,-1--1--1,,1|(1391,334)|
\\\---/// Sketch information - do not modify anything except names
V300 Do not put anything below this section - it will be ignored
*CFC-11
$192-192-192,0,Times New Roman|12||0-0-0|0-0-0|0-0-255|-1--1--1|-1--1--1|96,96
10,1,"CFC-11 in the troposphere",1195,454,67,47,3,3,0,0,0,0,0,0
12,2,48,1448,448,10,8,0,3,0,0,-1,0,0,0
1,3,5,1,4,0,0,22,0,0,0,-1--1--1,,1|(1303,448)|
1,4,5,2,100,0,0,22,0,0,0,-1--1--1,,1|(1397,448)|
11,5,48,1350,448,6,8,34,3,0,0,1,0,0,0
10,6,"CFC-11 emissions",1350,482,59,11,40,3,0,0,-1,0,0,0
12,7,48,1196,662,10,8,0,3,0,0,-1,0,0,0
1,8,10,7,4,0,0,22,0,0,0,-1--1--1,,1|(1196,619)|
1,9,10,1,100,0,0,22,0,0,0,-1--1--1,,1|(1196,536)|
11,10,48,1196,578,8,6,33,3,0,0,4,0,0,0
10,11,"removal of CFC-11 from the troposphere",1286,578,67,19,40,3,0,0,-1,0,0,0
10,12,"CFC-11 in the stratosphere",868,450,77,48,3,3,0,0,0,0,0,0
1,13,15,12,4,0,0,22,0,0,0,-1--1--1,,1|(990,455)|
1,14,15,1,100,0,0,22,0,0,0,-1--1--1,,1|(1087,455)|
11,15,2012,1041,455,6,8,34,3,0,0,1,0,0,0
10,16,"transport of CFC-11 to the stratosphere",1041,482,67,19,40,3,0,0,-1,0,0,0
10,17,"Reactive Cl in the stratosphere due to CFC-11",356,598,85,55,3,3,0,0,0,0,0,0
1,18,19,12,100,0,0,22,0,0,0,-1--1--1,,1|(737,450)|
11,19,2412,677,450,6,8,34,3,0,0,1,0,0,0
10,20,"chemical conversion of CFC-11",677,477,64,19,40,3,0,0,-1,0,0,0
12,21,48,74,596,10,8,0,3,0,0,-1,0,0,0
1,22,24,21,4,0,0,22,0,0,0,-1--1--1,,1|(126,596)|
1,23,24,17,100,0,0,22,0,0,0,-1--1--1,,1|(225,596)|
11,24,48,173,596,6,8,34,3,0,0,1,0,0,0

10,25,"removal of Cl produced from CFC-11 from the
stratosphere",173,640,76,28,40,3,0,0,-1,0,0,0
10,26,"CFC-11 atmospheric lifetime",627,310,63,19,8,3,0,0,0,0,0,0
1,27,17,25,1,0,43,0,2,192,0,-1--1--1,|12||0-0-0,1|(294,704)|
1,28,12,20,1,0,43,0,2,192,0,-1--1--1,|12||0-0-0,1|(792,522)|
1,29,1,15,1,0,43,0,2,192,0,-1--1--1,|12||0-0-0,1|(1094,386)|
1,30,1,11,1,0,43,0,2,64,0,-1--1--1,|12||0-0-0,1|(1287,510)|
10,31,"time to remove CFC-11 from the troposphere",1349,717,78,19,8,3,0,0,0,0,0,0
1,32,31,11,1,0,43,0,2,192,0,-1--1--1,|12||0-0-0,1|(1354,653)|
10,33,"% of CFC-11 transported to the stratosphere",1084,653,57,28,8,3,0,0,0,0,0,0
1,34,33,16,1,0,43,0,2,192,0,-1--1--1,|12||0-0-0,1|(1026,547)|
1,35,33,10,1,0,45,0,2,192,0,-1--1--1,|12||0-0-0,1|(1114,589)|
10,36,"amount of ozone that can be destroyed by Cl from CFC-
11",352,238,105,30,8,3,0,26,0,0,0,0,0-0-0,0-0-0,|14|B|255-0-0
1,37,17,36,1,0,43,0,2,192,0,-1--1--1,|14||255-0-0,1|(394,339)|
10,38,Cl lifetime,125,504,41,11,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
1,39,38,24,1,0,45,0,2,64,0,-1--1--1,|12||128-128-128,1|(140,558)|
10,40,time for ODS to move from the troposhere to the
stratosphere,913,607,93,28,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
1,41,40,16,1,0,0,0,0,64,0,-1--1--1,,1|(930,540)|
10,42,number of stratospheric ozone molecules destroyed by one Cl atom in a
year,169,323,100,28,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
1,43,42,36,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(208,264)|
10,44,Political willingness to adjust ODS emission policy,1881,737,73,28,8,2,0,3,-
1,0,0,0,128-128-128,0-0-0,|12||128-128-128
10,45,relative attention fraction of policy makers to ozone related cancer
risks,1615,117,97,28,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
10,46,"% of ODS replacement technology puzzles solved",1884,74,80,28,8,2,0,3,-
1,0,0,0,128-128-128,0-0-0,|12||128-128-128
10,47,"Annual CFC-11 emission rate",1999,390,62,38,3,3,0,0,0,0,0,0
12,48,48,2337,393,10,8,0,3,0,0,-1,0,0,0
1,49,51,47,4,0,0,22,0,0,0,-1--1--1,,1|(2124,391)|
1,50,51,48,100,0,0,22,2,0,0,-1--1--1,|12||128-128-128,1|(2263,391)|
11,51,48,2194,391,6,8,34,3,0,0,1,0,0,0
10,52,"annual growth in yearly CFC-11 emissions",2194,427,73,19,40,3,0,0,-1,0,0,0
10,53,"desired annual industry growth in CFC-11
emissions",2352,558,72,28,8,3,0,0,0,0,0,0
10,54,"annual percent of allowed CFC-11 baseline
emissions",1799,215,81,28,8,3,0,0,0,0,0,0
1,55,46,54,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(1864,148)|
1,56,45,54,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1686,130)|
1,57,53,52,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(2247,492)|
10,58,"senstivity of CFC-11 emission reduction to available replacement
technology",2045,200,108,28,8,3,0,0,0,0,0,0
1,59,58,54,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1930,255)|

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10,60,"min political willingness to restrict CFC-11
emissions",2176,732,88,28,8,3,0,0,0,0,0,0
1,61,47,51,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(2141,321)|
10,62,"CFC-11 molecules per thousand ton",1397,280,66,19,8,3,0,0,0,0,0,0
1,63,62,5,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1354,379)|
10,64,Time,2396,454,26,11,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
1,65,64,52,1,0,0,0,0,0,0,-1--1--1,,1|(2315,457)|
10,66,"number of Cl atoms in one molecule of CFC-11",665,740,80,19,8,3,0,0,0,0,0,0
12,67,48,561,451,10,8,0,3,0,0,-1,0,0,0
1,68,19,67,4,0,0,22,0,0,0,-1--1--1,,1|(621,450)|
1,69,26,19,1,0,45,0,2,64,0,-1--1--1,|12||128-128-128,1|(683,382)|
12,70,48,625,597,10,8,0,3,0,0,-1,0,0,0
1,71,73,17,4,0,0,22,0,0,0,-1--1--1,,1|(482,597)|
1,72,73,70,100,0,0,22,0,0,0,-1--1--1,,1|(575,597)|
11,73,48,528,597,6,8,34,3,0,0,1,0,0,0
10,74,"release of Cl from CFC-11 conversion",528,624,65,19,40,3,0,0,-1,0,0,0
1,75,66,74,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(553,701)|
1,76,20,73,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(562,517)|
10,77,coversion factor to ppt,983,252,52,19,8,3,0,0,0,0,0,0
10,78,"stratospheric concentration of CFC-11",786,224,52,28,8,3,0,0,0,0,0,0
1,79,12,78,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(838,310)|
1,80,77,78,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(894,211)|
12,81,48,1718,390,10,8,0,3,0,0,-1,0,0,0
1,82,84,81,4,0,0,22,0,0,0,-1--1--1,,1|(1777,390)|
1,83,84,47,100,0,0,22,0,0,0,-1--1--1,,1|(1887,390)|
11,84,48,1832,390,6,8,34,3,0,0,1,0,0,0
10,85,"annual decrease in CFC-11 emissions",1832,417,60,19,40,3,0,0,-1,0,0,0
1,86,47,84,1,0,0,0,0,64,0,-1--1--1,,1|(1920,328)|
10,87,"CFC-11 political willingness switch",2013,601,56,19,8,3,0,0,0,0,0,0
1,88,44,87,1,0,0,0,0,64,0,-1--1--1,,1|(1933,652)|
1,89,60,87,1,0,0,0,0,64,0,-1--1--1,,1|(2125,655)|
10,90,time to reduce emissions,1621,441,52,30,8,3,0,0,0,0,0,0
1,91,90,85,1,0,45,0,2,192,0,-1--1--1,|12||128-128-128,1|(1687,461)|
1,92,87,85,1,0,0,0,0,64,0,-1--1--1,,1|(1843,514)|
1,93,87,52,1,0,0,0,0,64,0,-1--1--1,,1|(2135,531)|
1,94,54,84,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1800,312)|
1,95,47,6,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1696,590)|
\\\---/// Sketch information - do not modify anything except names
V300  Do not put anything below this section - it will be ignored
*CFC-12
$192-192-192,0,Times New Roman|12||0-0-0|0-0-0|0-0-255|-1--1--1|-1--1--1|96,96
10,1,"CFC-12 in the troposphere",1120,476,67,47,3,3,0,0,0,0,0,0
12,2,48,1397,485,10,8,0,3,0,0,-1,0,0,0
1,3,5,1,4,0,0,22,0,0,0,-1--1--1,,1|(1240,484)|
1,4,5,2,100,0,0,22,0,0,0,-1--1--1,,1|(1346,484)|
11,5,48,1299,484,6,8,34,3,0,0,1,0,0,0
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10,6,"annual CFC-12 emissions (molecules)",1299,518,69,19,40,3,0,0,-1,0,0,0
12,7,48,1120,687,10,8,0,3,0,0,-1,0,0,0
1,8,10,7,4,0,0,22,0,0,0,-1--1--1,,1|(1118,644)|
1,9,10,1,100,0,0,22,0,0,0,-1--1--1,,1|(1118,560)|
11,10,48,1118,603,8,6,33,3,0,0,4,0,0,0
10,11,"removal of CFC-12 from the troposphere",1185,603,59,29,40,3,0,0,-1,0,0,0
10,12,"CFC-12 in the stratosphere",769,475,77,48,3,3,0,0,0,0,0,0
1,13,15,12,4,0,0,22,0,0,0,-1--1--1,,1|(899,480)|
1,14,15,1,100,0,0,22,0,0,0,-1--1--1,,1|(1008,480)|
11,15,3596,958,480,6,8,34,3,0,0,1,0,0,0
10,16,"transport of CFC-12 to the stratosphere",958,507,67,19,40,3,0,0,-1,0,0,0
10,17,"Reactive Cl in the stratosphere due to CFC-12",366,668,87,49,3,3,0,0,0,0,0,0
1,18,19,12,100,0,0,22,0,0,0,-1--1--1,,1|(655,475)|
11,19,2444,611,475,6,8,34,3,0,0,1,0,0,0
10,20,"chemical conversion of CFC-12",611,502,64,19,40,3,0,0,-1,0,0,0
12,21,48,94,669,10,8,0,3,0,0,-1,0,0,0
1,22,24,21,4,0,0,22,0,0,0,-1--1--1,,1|(146,669)|
1,23,24,17,100,0,0,22,0,0,0,-1--1--1,,1|(239,669)|
11,24,48,193,669,6,8,34,3,0,0,1,0,0,0
10,25,"removal of Cl produced from CFC-12 from the
stratosphere",193,718,76,28,40,3,0,0,-1,0,0,0
10,26,"CFC-12 atmospheric lifetime",594,344,63,19,8,3,0,0,0,0,0,0
1,27,17,25,1,0,43,0,2,192,0,-1--1--1,|12||0-0-0,1|(302,761)|
1,28,12,20,1,0,43,0,2,192,0,-1--1--1,|12||0-0-0,1|(703,563)|
10,29,time for ODS to move from the troposhere to the
stratosphere,893,648,88,28,8,3,0,0,0,0,0,0
1,30,29,16,1,0,45,0,2,64,0,-1--1--1,|12||0-0-0,1|(884,578)|
1,31,1,15,1,0,43,0,2,192,0,-1--1--1,|12||0-0-0,1|(1032,431)|
1,32,1,11,1,0,43,0,2,64,0,-1--1--1,|12||0-0-0,1|(1196,526)|
10,33,"time to remove CFC-12 from the troposphere",1349,709,78,19,8,3,0,0,0,0,0,0
1,34,33,11,1,0,43,0,2,192,0,-1--1--1,|12||0-0-0,1|(1323,636)|
10,35,"% of CFC-12 transported to the stratosphere",1033,678,57,28,8,3,0,0,0,0,0,0
1,36,35,16,1,0,43,0,2,192,0,-1--1--1,|12||0-0-0,1|(954,578)|
1,37,35,10,1,0,45,0,2,192,0,-1--1--1,|12||0-0-0,1|(1063,614)|
10,38,number of stratospheric ozone molecules destroyed by one Cl atom in a
year,189,365,95,28,8,3,0,0,0,0,0,0
10,39,"amount of ozone that can be destroyed by Cl from CFC-
12",343,276,105,30,8,3,0,26,0,0,0,0,0-0-0,0-0-0,|14|B|255-0-0
1,40,17,39,1,0,43,0,2,192,0,-1--1--1,|14||255-0-0,1|(363,371)|
1,41,38,39,1,0,43,0,2,192,0,-1--1--1,|14||255-0-0,1|(226,295)|
10,42,Cl lifetime,129,561,32,11,8,3,0,0,0,0,0,0
1,43,42,24,1,0,45,0,2,64,0,-1--1--1,|14||255-0-0,1|(167,641)|
10,44,Political willingness to adjust ODS emission policy,2159,860,73,28,8,2,0,3,-
1,0,0,0,128-128-128,0-0-0,|12||128-128-128
10,45,relative attention fraction of policy makers to ozone related cancer
risks,1695,188,97,28,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128

10,46,"% of ODS replacement technology puzzles solved",1964,145,80,28,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
10,47,"Annual CFC-12 emission rate",2003,512,62,38,3,3,0,0,0,0,0,0
12,48,48,2341,515,10,8,0,3,0,0,-1,0,0,0
1,49,51,47,4,0,0,22,0,0,0,-1--1--1,,1|(2128,513)|
1,50,51,48,100,0,0,22,2,0,0,-1--1--1,|12||128-128-128,1|(2267,513)|
11,51,48,2198,513,6,8,34,3,0,0,1,0,0,0
10,52,"annual growth in yearly CFC-12 emissions",2198,549,73,19,40,3,0,0,-1,0,0,0
10,53,"desired annual industry growth in CFC-12 emissions",2413,664,72,28,8,3,0,0,0,0,0,0
10,54,"annual decrease in CFC-12 emissions",1879,286,60,19,8,3,0,0,0,0,0,0
1,55,46,54,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(1944,219)|
1,56,45,54,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1766,201)|
1,57,53,52,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(2230,607)|
10,58,"senstivity of CFC-12 emission reduction to available replacement technology",2165,284,100,40,8,3,0,0,0,0,0,0
1,59,58,54,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(2003,325)|
10,60,"min political willingness to restrict CFC-12 emissions",1887,850,84,19,8,3,0,0,0,0,0,0
1,61,47,51,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(2133,465)|
10,62,"CFC-12 molecules per thousand tons",1552,296,61,19,8,3,0,0,0,0,0,0
1,63,62,5,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1381,368)|
10,64,Time,2427,564,26,11,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
1,65,64,52,1,0,0,0,0,0,0,-1--1--1,,1|(2350,583)|
10,66,"number of Cl atoms in one molecule of CFC-12",671,817,80,19,8,3,0,0,0,0,0,0
12,67,48,499,474,10,8,0,3,0,0,-1,0,0,0
1,68,19,67,4,0,0,22,0,0,0,-1--1--1,,1|(557,475)|
1,69,26,19,1,0,45,0,2,64,0,-1--1--1,|12||128-128-128,1|(623,408)|
12,70,48,631,671,10,8,0,3,0,0,-1,0,0,0
1,71,73,17,4,0,0,22,0,0,0,-1--1--1,,1|(497,671)|
1,72,73,70,100,0,0,22,0,0,0,-1--1--1,,1|(587,671)|
11,73,48,546,671,6,8,34,3,0,0,1,0,0,0
10,74,"release of Cl from CFC-12 conversion",546,705,65,19,40,3,0,0,-1,0,0,0
1,75,66,74,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(569,774)|
1,76,20,73,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(523,591)|
10,77,"CFC-12 political willingness switch",2033,730,56,19,8,3,0,0,0,0,0,0
1,78,60,77,1,0,0,0,0,64,0,-1--1--1,,1|(1914,762)|
1,79,44,77,1,0,0,0,0,64,0,-1--1--1,,1|(2150,786)|
12,80,48,1694,511,10,8,0,3,0,0,-1,0,0,0
1,81,83,80,4,0,0,22,0,0,0,-1--1--1,,1|(1760,511)|
1,82,83,47,100,0,0,22,0,0,0,-1--1--1,,1|(1884,511)|
11,83,48,1822,511,6,8,34,3,0,0,1,0,0,0
10,84,"annual decrease in yearly CFC-12 emissions",1822,547,58,28,40,3,0,0,-1,0,0,0
1,85,77,84,1,0,0,0,0,64,0,-1--1--1,,1|(1849,624)|
1,86,77,52,1,0,0,0,0,64,0,-1--1--1,,1|(2130,662)|
1,87,47,83,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(1910,458)|

1,88,47,6,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1679,665)|
1,89,54,83,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(1793,388)|
10,90,time to reduce emissions,1614,516,50,19,8,2,0,3,-1,0,0,0,128-128-128,0-0-
0,|12||128-128-128
1,91,90,84,1,0,0,0,0,64,0,-1--1--1,,1|(1701,588)|
\\\---/// Sketch information - do not modify anything except names
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*CFC-113
$192-192-192,0,Times New Roman|12||0-0-0|0-0-0|0-0-255|-1--1--1|-1--1--1|96,96
10,1,"CFC-113 in the troposphere",1198,526,67,47,3,3,0,0,0,0,0,0
12,2,48,1451,520,10,8,0,3,0,0,-1,0,0,0
1,3,5,1,4,0,0,22,0,0,0,-1--1--1,,1|(1306,520)|
1,4,5,2,100,0,0,22,0,0,0,-1--1--1,,1|(1400,520)|
11,5,48,1353,520,6,8,34,3,0,0,1,0,0,0
10,6,"CFC-113 emissions",1353,554,33,19,40,3,0,0,-1,0,0,0
12,7,48,1199,734,10,8,0,3,0,0,-1,0,0,0
1,8,10,7,4,0,0,22,0,0,0,-1--1--1,,1|(1199,691)|
1,9,10,1,100,0,0,22,0,0,0,-1--1--1,,1|(1199,608)|
11,10,48,1199,650,8,6,33,3,0,0,4,0,0,0
10,11,"removal of CFC-113 from the troposphere",1289,650,82,20,40,3,0,0,-1,0,0,0
10,12,"CFC-113 in the stratosphere",866,522,77,48,3,3,0,0,0,0,0,0
1,13,15,12,4,0,0,22,0,0,0,-1--1--1,,1|(990,527)|
1,14,15,1,100,0,0,22,0,0,0,-1--1--1,,1|(1090,527)|
11,15,3564,1044,527,6,8,34,3,0,0,1,0,0,0
10,16,"transport of CFC-113 to the stratosphere",1044,554,71,19,40,3,0,0,-1,0,0,0
10,17,"Reactive Cl in the stratosphere due to CFC-113",422,703,91,50,3,3,0,0,0,0,0,0
1,18,19,12,100,0,0,22,0,0,0,-1--1--1,,1|(737,522)|
11,19,2428,680,522,6,8,34,3,0,0,1,0,0,0
10,20,"chemical conversion of CFC-113",680,549,64,19,40,3,0,0,-1,0,0,0
12,21,48,140,703,10,8,0,3,0,0,-1,0,0,0
1,22,24,21,4,0,0,22,0,0,0,-1--1--1,,1|(191,703)|
1,23,24,17,100,0,0,22,0,0,0,-1--1--1,,1|(288,703)|
11,24,48,239,703,6,8,34,3,0,0,1,0,0,0
10,25,"removal of Cl produced from CFC-113 from the
stratosphere",239,752,93,28,40,3,0,0,-1,0,0,0
10,26,"CFC-113 atmospheric lifetime",644,363,63,19,8,3,0,0,0,0,0,0
1,27,17,25,1,0,43,0,2,192,0,-1--1--1,|12||0-0-0,1|(352,800)|
1,28,12,20,1,0,43,0,2,192,0,-1--1--1,|12||0-0-0,1|(795,585)|
1,29,1,15,1,0,43,0,2,192,0,-1--1--1,|12||0-0-0,1|(1094,458)|
1,30,1,11,1,0,43,0,2,64,0,-1--1--1,|12||0-0-0,1|(1290,583)|
10,31,"time to remove CFC-113 from the troposphere",1403,756,61,28,8,3,0,0,0,0,0,0
1,32,31,11,1,0,43,0,2,192,0,-1--1--1,|12||0-0-0,1|(1383,693)|
10,33,"% of CFC-113 transported to the stratosphere",1087,725,57,28,8,3,0,0,0,0,0,0
1,34,33,16,1,0,43,0,2,192,0,-1--1--1,|12||0-0-0,1|(1029,619)|
1,35,33,10,1,0,45,0,2,192,0,-1--1--1,|12||0-0-0,1|(1117,661)|

10,36,"amount of ozone that can be destroyed by Cl from CFC-
113",342,290,89,30,8,3,0,26,0,0,0,0,0-0-0,0-0-0,|14|B|255-0-0
1,37,17,36,1,0,43,0,2,192,0,-1--1--1,|14||255-0-0,1|(439,474)|
10,38,Cl lifetime,191,611,41,11,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
1,39,38,24,1,0,45,0,2,64,0,-1--1--1,|12||128-128-128,1|(206,665)|
10,40,time for ODS to move from the troposhere to the
stratosphere,916,679,93,28,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
1,41,40,16,1,0,0,0,0,64,0,-1--1--1,,1|(933,612)|
10,42,number of stratospheric ozone molecules destroyed by one Cl atom in a
year,159,375,100,28,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
1,43,42,36,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(198,316)|
10,44,Political willingness to adjust ODS emission policy,1926,872,73,28,8,2,0,3,-
1,0,0,0,128-128-128,0-0-0,|12||128-128-128
10,45,relative attention fraction of policy makers to ozone related cancer
risks,1641,223,97,28,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
10,46,"% of ODS replacement technology puzzles solved",1910,180,80,28,8,2,0,3,-
1,0,0,0,128-128-128,0-0-0,|12||128-128-128
10,47,"Annual CFC-113 emission rate",2023,526,62,38,3,3,0,0,0,0,0,0
12,48,48,2361,529,10,8,0,3,0,0,-1,0,0,0
1,49,51,47,4,0,0,22,0,0,0,-1--1--1,,1|(2148,527)|
1,50,51,48,100,0,0,22,2,0,0,-1--1--1,|12||128-128-128,1|(2287,527)|
11,51,48,2218,527,6,8,34,3,0,0,1,0,0,0
10,52,"increase in yearly CRC-113 emissions",2218,563,65,19,40,3,0,0,-1,0,0,0
10,53,"desired annual industry growth in CFC-113
emissions",2388,698,72,28,8,3,0,0,0,0,0,0
10,54,"annual decrease in CFC-113 emissions",1825,321,67,19,8,3,0,0,0,0,0,0
1,55,46,54,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(1890,254)|
1,56,45,54,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1712,236)|
1,57,53,52,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(2258,632)|
10,58,"senstivity of CFC-113 emission reduction to available replacement
technology",2088,326,94,38,8,3,0,0,0,0,0,0
1,59,58,54,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1951,348)|
10,60,"min political willingness to restrict CFC-113
emissions",2140,858,84,28,8,3,0,0,0,0,0,0
1,61,47,51,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(2165,457)|
10,62,"CFC-113 molecules per thousand ton",1502,354,67,25,8,3,0,0,0,0,0,0
1,63,62,5,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1404,437)|
10,64,Time,2414,567,26,11,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
1,65,64,52,1,0,0,0,0,0,0,-1--1--1,,1|(2330,596)|
10,66,"number of Cl atoms in one molecule of CFC-113",751,837,70,28,8,3,0,0,0,0,0,0
12,67,48,566,521,10,8,0,3,0,0,-1,0,0,0
1,68,19,67,4,0,0,22,0,0,0,-1--1--1,,1|(625,522)|
12,69,48,704,701,10,8,0,3,0,0,-1,0,0,0
1,70,72,17,4,0,0,22,0,0,0,-1--1--1,,1|(559,698)|
1,71,72,69,100,0,0,22,0,0,0,-1--1--1,,1|(655,698)|
11,72,48,611,698,6,8,34,3,0,0,1,0,0,0

10,73,"release of Cl from CFC-113 conversion",611,730,69,24,40,3,0,0,-1,0,0,0
1,74,26,19,1,0,45,0,2,64,0,-1--1--1,|12||128-128-128,1|(659,478)|
1,75,20,72,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(608,641)|
1,76,66,73,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(617,791)|
10,77,"CFC-113 political willingness switch",2034,741,59,19,8,3,0,0,0,0,0,0
1,78,44,77,1,0,0,0,0,64,0,-1--1--1,,1|(1943,779)|
1,79,60,77,1,0,0,0,0,64,0,-1--1--1,,1|(2129,805)|
1,80,77,52,1,0,0,0,0,64,0,-1--1--1,,1|(2152,672)|
12,81,48,1751,526,10,8,0,3,0,0,-1,0,0,0
1,82,84,81,4,0,0,22,0,0,0,-1--1--1,,1|(1808,526)|
1,83,84,47,100,0,0,22,0,0,0,-1--1--1,,1|(1914,526)|
11,84,48,1861,526,6,8,34,3,0,0,1,0,0,0
10,85,"decrease in annual CFC-113 emissions",1861,553,65,19,40,3,0,0,-1,0,0,0
1,86,47,84,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(1978,453)|
1,87,77,85,1,0,0,0,0,64,0,-1--1--1,,1|(1905,655)|
1,88,47,6,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1726,698)|
1,89,54,84,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(1800,415)|
10,90,time to reduce emissions,1681,553,50,19,8,2,0,3,-1,0,0,0,128-128-128,0-0-
0,|12||128-128-128
1,91,90,85,1,0,0,0,0,64,0,-1--1--1,,1|(1776,590)|
\\\---/// Sketch information - do not modify anything except names
V300 Do not put anything below this section - it will be ignored
*CCL4
$192-192-192,0,Times New Roman|12||0-0-0|0-0-0|0-0-255|-1--1--1|-1--1--1|96,96
10,1,CCl4 in the troposphere,1227,510,67,47,3,3,0,0,0,0,0,0
12,2,48,1480,504,10,8,0,3,0,0,-1,0,0,0
1,3,5,1,4,0,0,22,0,0,0,-1--1--1,,1|(1335,504)|
1,4,5,2,100,0,0,22,0,0,0,-1--1--1,,1|(1429,504)|
11,5,48,1382,504,6,8,34,3,0,0,1,0,0,0
10,6,CCl4 emissions,1382,538,49,11,40,3,0,0,-1,0,0,0
12,7,48,1228,718,10,8,0,3,0,0,-1,0,0,0
1,8,10,7,4,0,0,22,0,0,0,-1--1--1,,1|(1228,675)|
1,9,10,1,100,0,0,22,0,0,0,-1--1--1,,1|(1228,592)|
11,10,48,1228,634,8,6,33,3,0,0,4,0,0,0
10,11,removal of CCl4 from the troposphere,1318,634,70,19,40,3,0,0,-1,0,0,0
10,12,CCl4 in the stratosphere,896,506,73,48,3,3,0,0,0,0,0,0
1,13,15,12,4,0,0,22,0,0,0,-1--1--1,,1|(1018,511)|
1,14,15,1,100,0,0,22,0,0,0,-1--1--1,,1|(1119,511)|
11,15,3516,1073,511,6,8,34,3,0,0,1,0,0,0
10,16,transport of CCl4 to the stratosphere,1073,538,65,19,40,3,0,0,-1,0,0,0
10,17,Reactive Cl in the stratosphere due to CCl4,459,669,87,49,3,3,0,0,0,0,0,0
1,18,19,12,100,0,0,22,0,0,0,-1--1--1,,1|(769,506)|
11,19,2396,709,506,6,8,34,3,0,0,1,0,0,0
10,20,chemical conversion of CCl4,709,533,64,19,40,3,0,0,-1,0,0,0
12,21,48,181,670,10,8,0,3,0,0,-1,0,0,0
1,22,24,21,4,0,0,22,0,0,0,-1--1--1,,1|(233,670)|

1,23,24,17,100,0,0,22,0,0,0,-1--1--1,,1|(329,670)|
11,24,48,280,670,6,8,34,3,0,0,1,0,0,0
10,25,removal of Cl produced from CCl4 from the stratosphere,280,719,76,28,40,3,0,0,-1,0,0,0
10,26,CCl4 atmospheric lifetime,812,371,58,19,8,3,0,0,0,0,0,0
1,27,17,25,1,0,43,0,2,192,0,-1--1--1,|12||0-0-0,1|(393,767)|
1,28,12,20,1,0,43,0,2,192,0,-1--1--1,|12||0-0-0,1|(824,578)|
1,29,1,15,1,0,43,0,2,192,0,-1--1--1,|12||0-0-0,1|(1123,442)|
1,30,1,11,1,0,43,0,2,64,0,-1--1--1,|12||0-0-0,1|(1319,567)|
10,31,time to remove CCl4 from the troposphere,1432,740,67,19,8,3,0,0,0,0,0,0
1,32,31,11,1,0,43,0,2,192,0,-1--1--1,|12||0-0-0,1|(1412,677)|
10,33,"% of CCl4 transported to the stratosphere",1116,709,73,19,8,3,0,0,0,0,0,0
1,34,33,16,1,0,43,0,2,192,0,-1--1--1,|12||0-0-0,1|(1058,603)|
1,35,33,10,1,0,45,0,2,192,0,-1--1--1,|12||0-0-0,1|(1146,645)|
10,36,amount of ozone that can be destroyed by Cl from CCl4,359,304,89,30,8,3,0,26,0,0,0,0,0-0-0,0-0-0,|14|B|255-0-0
1,37,17,36,1,0,43,0,2,192,0,-1--1--1,|14||255-0-0,1|(439,425)|
10,38,Cl lifetime,232,578,41,11,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
1,39,38,24,1,0,45,0,2,64,0,-1--1--1,|12||128-128-128,1|(247,632)|
10,40,time for ODS to move from the troposhere to the stratosphere,945,663,93,28,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
1,41,40,16,1,0,0,0,0,64,0,-1--1--1,,1|(962,596)|
10,42,number of stratospheric ozone molecules destroyed by one Cl atom in a year,176,389,100,28,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
1,43,42,36,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(215,330)|
10,44,Political willingness to adjust ODS emission policy,2215,854,73,28,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
10,45,relative attention fraction of policy makers to ozone related cancer risks,1684,186,97,28,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
10,46,"% of ODS replacement technology puzzles solved",1914,157,80,28,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
10,47,Annual CCl4 emission rate,2064,498,62,38,3,3,0,0,0,0,0,0
12,48,48,2402,501,10,8,0,3,0,0,-1,0,0,0
1,49,51,47,4,0,0,22,0,0,0,-1--1--1,,1|(2189,499)|
1,50,51,48,100,0,0,22,2,0,0,-1--1--1,|12||128-128-128,1|(2328,499)|
11,51,48,2259,499,6,8,34,3,0,0,1,0,0,0
10,52,increase in yearly CCl4 emissions,2259,535,55,19,40,3,0,0,-1,0,0,0
10,53,desired annual industry growth in CCl4 emissions,2409,685,72,28,8,3,0,0,0,0,0,0
10,54,annual decrease in CCl4 emissions,1876,326,67,19,8,3,0,0,0,0,0,0
1,55,46,54,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(1920,238)|
1,56,45,54,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1764,209)|
1,57,53,52,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(2291,613)|
10,58,senstivity of CCl4 emission reduction to available replacement technology,2103,240,100,38,8,3,0,0,0,0,0,0
1,59,58,54,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1994,322)|
10,60,min political willingness to restrict CCl4 emissions,1985,857,84,28,8,3,0,0,0,0,0,0

1,61,47,51,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(2190,444)|
10,62,CCl4 molecules per thousand tons,1570,378,61,19,8,3,0,0,0,0,0,0
1,63,62,5,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1415,441)|
10,64,number of Cl atoms in one molecule of CCl4,672,827,70,19,8,3,0,0,0,0,0,0
12,65,48,588,507,10,8,0,3,0,0,-1,0,0,0
1,66,19,65,4,0,0,22,0,0,0,-1--1--1,,1|(651,506)|
12,67,48,734,666,10,8,0,3,0,0,-1,0,0,0
1,68,70,17,4,0,0,22,0,0,0,-1--1--1,,1|(595,667)|
1,69,70,67,100,0,0,22,0,0,0,-1--1--1,,1|(690,667)|
11,70,48,649,667,6,8,34,3,0,0,1,0,0,0
10,71,release of Cl from CCl4 conversion,649,699,57,24,40,3,0,0,-1,0,0,0
1,72,26,19,1,0,45,0,2,192,0,-1--1--1,|12||128-128-128,1|(716,453)|
1,73,20,70,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(643,605)|
1,74,64,71,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(634,759)|
10,75,Time,2443,566,26,11,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
1,76,75,52,1,0,0,0,0,0,0,-1--1--1,,1|(2357,588)|
10,77,CCl4 political willingness switch,2089,714,56,19,8,3,0,0,0,0,0,0
1,78,60,77,1,0,0,0,0,64,0,-1--1--1,,1|(1985,776)|
1,79,44,77,1,0,0,0,0,64,0,-1--1--1,,1|(2182,769)|
12,80,48,1746,496,10,8,0,3,0,0,-1,0,0,0
1,81,83,80,4,0,0,22,0,0,0,-1--1--1,,1|(1814,496)|
1,82,83,47,100,0,0,22,0,0,0,-1--1--1,,1|(1943,496)|
11,83,48,1879,496,6,8,34,3,0,0,1,0,0,0
10,84,decrease in yearly CCl4 emissions,1879,523,57,19,40,3,0,0,-1,0,0,0
1,85,77,52,1,0,0,0,0,64,0,-1--1--1,,1|(2195,653)|
1,86,77,84,1,0,0,0,0,64,0,-1--1--1,,1|(1927,626)|
1,87,47,6,1,0,0,0,0,64,0,-1--1--1,,1|(1779,643)|
1,88,54,83,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1849,395)|
1,89,47,83,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1996,447)|
10,90,time to reduce emissions,1704,556,50,19,8,2,0,3,-1,0,0,0,128-128-128,0-0-
0,|12||128-128-128
1,91,90,84,1,0,45,0,2,192,0,-1--1--1,|12||128-128-128,1|(1790,563)|
\\\---/// Sketch information - do not modify anything except names
V300 Do not put anything below this section - it will be ignored
*CH3CCL3
$192-192-192,0,Times New Roman|12||0-0-0|0-0-0|0-0-255|-1--1--1|-1--1--1|96,96
10,1,CH3CCl3 in the troposphere,1170,525,67,47,3,3,0,0,0,0,0,0
12,2,48,1423,519,10,8,0,3,0,0,-1,0,0,0
1,3,5,1,4,0,0,22,0,0,0,-1--1--1,,1|(1278,519)|
1,4,5,2,100,0,0,22,0,0,0,-1--1--1,,1|(1372,519)|
11,5,48,1325,519,6,8,34,3,0,0,1,0,0,0
10,6,CH3CCl3 emissions,1325,553,34,19,40,3,0,0,-1,0,0,0
12,7,48,1171,733,10,8,0,3,0,0,-1,0,0,0
1,8,10,7,4,0,0,22,0,0,0,-1--1--1,,1|(1171,690)|
1,9,10,1,100,0,0,22,0,0,0,-1--1--1,,1|(1171,607)|
11,10,48,1171,649,8,6,33,3,0,0,4,0,0,0

10,11,removal of CH3CCl3 from the troposphere,1261,649,69,19,40,3,0,0,-1,0,0,0
10,12,CH3CCl3 in the stratosphere,839,521,73,48,3,3,0,0,0,0,0,0
1,13,15,12,4,0,0,22,0,0,0,-1--1--1,,1|(961,526)|
1,14,15,1,100,0,0,22,0,0,0,-1--1--1,,1|(1062,526)|
11,15,3372,1016,526,6,8,34,3,0,0,1,0,0,0
10,16,transport of CH3CCl3 to the stratosphere,1016,553,72,19,40,3,0,0,-1,0,0,0
10,17,Reactive Cl in the stratosphere due to CH3CCl3,403,710,86,50,3,3,0,0,0,0,0,0
1,18,19,12,100,0,0,22,0,0,0,-1--1--1,,1|(712,521)|
11,19,2460,652,521,6,8,34,3,0,0,1,0,0,0
10,20,chemical conversion of CH3CCl3,652,548,64,19,40,3,0,0,-1,0,0,0
12,21,48,126,710,10,8,0,3,0,0,-1,0,0,0
1,22,24,21,4,0,0,22,0,0,0,-1--1--1,,1|(178,710)|
1,23,24,17,100,0,0,22,0,0,0,-1--1--1,,1|(274,710)|
11,24,48,225,710,6,8,34,3,0,0,1,0,0,0
10,25,removal of Cl produced from CH3CCl3 from the
stratosphere,225,759,93,28,40,3,0,0,-1,0,0,0
10,26,CH3CCl3 atmospheric lifetime,727,367,63,19,8,3,0,0,0,0,0,0
1,27,17,25,1,0,43,0,2,192,0,-1--1--1,|12||0-0-0,1|(338,807)|
1,28,12,20,1,0,43,0,2,192,0,-1--1--1,|12||0-0-0,1|(767,593)|
1,29,1,15,1,0,43,0,2,192,0,-1--1--1,|12||0-0-0,1|(1066,457)|
1,30,1,11,1,0,43,0,2,64,0,-1--1--1,|12||0-0-0,1|(1262,582)|
10,31,time to remove CH3CCl3 from the troposphere,1375,755,62,28,8,3,0,0,0,0,0,0
1,32,31,11,1,0,43,0,2,192,0,-1--1--1,|12||0-0-0,1|(1355,692)|
10,33,"% of CH3CCl3 transported to the stratosphere",1059,724,57,28,8,3,0,0,0,0,0,0
1,34,33,16,1,0,43,0,2,192,0,-1--1--1,|12||0-0-0,1|(1001,618)|
1,35,33,10,1,0,45,0,2,192,0,-1--1--1,|12||0-0-0,1|(1089,660)|
10,36,amount of ozone that can be destroyed by Cl from
CH3CCl3,354,320,89,30,8,3,0,26,0,0,0,0,0-0-0,0-0-0,|14|B|255-0-0
1,37,17,36,1,0,43,0,2,192,0,-1--1--1,|14||255-0-0,1|(416,429)|
10,38,Cl lifetime,177,618,41,11,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
1,39,38,24,1,0,45,0,2,64,0,-1--1--1,|12||128-128-128,1|(192,672)|
10,40,time for ODS to move from the troposhere to the
stratosphere,888,678,93,28,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
1,41,40,16,1,0,0,0,0,64,0,-1--1--1,,1|(905,611)|
10,42,number of stratospheric ozone molecules destroyed by one Cl atom in a
year,171,405,100,28,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
1,43,42,36,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(210,346)|
10,44,Political willingness to adjust ODS emission policy,2018,850,73,28,8,2,0,3,-
1,0,0,0,128-128-128,0-0-0,|12||128-128-128
10,45,relative attention fraction of policy makers to ozone related cancer
risks,1619,187,97,28,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
10,46,"% of ODS replacement technology puzzles solved",1888,144,80,28,8,2,0,3,-
1,0,0,0,128-128-128,0-0-0,|12||128-128-128
10,47,Annual CH3CCl3 emission rate,1910,506,62,38,3,3,0,0,0,0,0,0
12,48,48,2248,509,10,8,0,3,0,0,-1,0,0,0
1,49,51,47,4,0,0,22,0,0,0,-1--1--1,,1|(2035,507)|

1,50,51,48,100,0,0,22,2,0,0,-1--1--1,|12||128-128-128,1|(2174,507)|
11,51,48,2105,507,6,8,34,3,0,0,1,0,0,0
10,52,increase in yearly CH3CCl3 emissions,2105,536,68,21,40,3,0,0,-1,0,0,0
10,53,desired annual industry growth in CH3CCl3
emissions,2337,700,72,28,8,3,0,0,0,0,0,0
10,54,annual decrease in CH3CCl3 emissions,1804,295,62,29,8,3,0,0,0,0,0,0
1,55,46,54,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(1868,218)|
1,56,45,54,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1690,200)|
1,57,53,52,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(2155,624)|
10,58,senstivity of CH3CCl3 emission reduction to available replacement
technology,2077,295,82,52,8,3,0,0,0,0,0,0
1,59,58,54,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1922,360)|
10,60,min political willingness to restrict CH3CCl3
emissions,1787,846,71,29,8,3,0,0,0,0,0,0
10,61,CH3CCl3 molecules per thousand ton,1529,384,68,19,8,3,0,0,0,0,0,0
1,62,61,5,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1389,407)|
10,63,number of Cl atoms in one molecule of CH3CCl3,723,848,70,28,8,3,0,0,0,0,0,0
12,64,48,522,521,10,8,0,3,0,0,-1,0,0,0
1,65,19,64,4,0,0,22,0,0,0,-1--1--1,,1|(589,521)|
1,66,26,19,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(637,477)|
12,67,48,672,705,10,8,0,3,0,0,-1,0,0,0
1,68,70,17,4,0,0,22,0,0,0,-1--1--1,,1|(536,704)|
1,69,70,67,100,0,0,22,0,0,0,-1--1--1,,1|(629,704)|
11,70,48,589,704,6,8,34,3,0,0,1,0,0,0
10,71,release of Cl from CH3CCl3 conversion,589,731,70,19,40,3,0,0,-1,0,0,0
1,72,20,70,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(581,650)|
1,73,63,71,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(607,783)|
10,74,Time,2346,562,26,11,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
1,75,74,52,1,0,0,0,0,0,0,-1--1--1,,1|(2224,599)|
12,76,48,1636,505,10,8,0,3,0,0,-1,0,0,0
1,77,79,76,4,0,0,22,0,0,0,-1--1--1,,1|(1693,505)|
1,78,79,47,100,0,0,22,0,0,0,-1--1--1,,1|(1800,505)|
11,79,48,1747,505,6,8,34,3,0,0,1,0,0,0
10,80,decrease in yearly CH3CCl3 emissions,1747,539,71,26,40,3,0,0,-1,0,0,0
1,81,47,6,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1686,671)|
1,82,47,79,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(1848,445)|
1,83,54,79,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1717,406)|
10,84,time to reduce emissions,1596,583,50,19,8,2,0,3,-1,0,0,0,128-128-128,0-0-
0,|12||128-128-128
1,85,84,80,1,0,45,0,2,192,0,-1--1--1,|12||128-128-128,1|(1690,606)|
10,86,CH3CCl3 political willingness switch,1901,716,60,19,8,3,0,0,0,0,0,0
1,87,60,86,1,0,0,0,0,64,0,-1--1--1,,1|(1795,780)|
1,88,44,86,1,0,0,0,0,64,0,-1--1--1,,1|(1990,766)|
1,89,86,52,1,0,0,0,0,64,0,-1--1--1,,1|(2023,643)|
1,90,86,80,1,0,0,0,0,64,0,-1--1--1,,1|(1766,593)|
\\\---/// Sketch information - do not modify anything except names

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V300  Do not put anything below this section - it will be ignored
*Halon-1301
$192-192-192,0,Times New Roman|12||0-0-0|0-0-0|0-0-255|-1--1--1|-1--1--1|96,96
10,1,"Halon-1301 in the troposphere",1278,520,67,47,3,3,0,0,0,0,0,0
12,2,48,1531,514,10,8,0,3,0,0,-1,0,0,0
1,3,5,1,4,0,0,22,0,0,0,-1--1--1,,1|(1386,514)|
1,4,5,2,100,0,0,22,0,0,0,-1--1--1,,1|(1480,514)|
11,5,48,1433,514,6,8,34,3,0,0,1,0,0,0
10,6,"halon-1301 emissions",1433,548,37,19,40,3,0,0,-1,0,0,0
12,7,48,1279,728,10,8,0,3,0,0,-1,0,0,0
1,8,10,7,4,0,0,22,0,0,0,-1--1--1,,1|(1279,685)|
1,9,10,1,100,0,0,22,0,0,0,-1--1--1,,1|(1279,602)|
11,10,48,1279,644,8,6,33,3,0,0,4,0,0,0
10,11,"removal of halon-1301 from the troposphere",1369,644,73,19,40,3,0,0,-1,0,0,0
10,12,"Halon-1301 in the stratosphere",947,516,73,48,3,3,0,0,0,0,0,0
1,13,15,12,4,0,0,22,0,0,0,-1--1--1,,1|(1069,521)|
1,14,15,1,100,0,0,22,0,0,0,-1--1--1,,1|(1170,521)|
11,15,3628,1124,521,6,8,34,3,0,0,1,0,0,0
10,16,"transport of halon-1301 to the stratosphere",1124,564,76,19,40,3,0,0,-1,0,0,0
10,17,"Reactive Br in the stratosphere due to halon-1301",508,701,77,50,3,3,0,0,0,0,0,0
1,18,19,12,100,0,0,22,0,0,0,-1--1--1,,1|(820,516)|
11,19,2796,760,516,6,8,34,3,0,0,1,0,0,0
10,20,"chemical conversion of halon-1301",760,543,64,19,40,3,0,0,-1,0,0,0
12,21,48,240,701,10,8,0,3,0,0,-1,0,0,0
1,22,24,21,4,0,0,22,0,0,0,-1--1--1,,1|(292,701)|
1,23,24,17,100,0,0,22,0,0,0,-1--1--1,,1|(388,701)|
11,24,48,339,701,6,8,34,3,0,0,1,0,0,0
10,25,"removal of Br produced from halon-1301 from the
stratosphere",339,750,93,28,40,3,0,0,-1,0,0,0
10,26,"halon-1301 atmospheric lifetime",801,368,63,19,8,3,0,0,0,0,0,0
1,27,17,25,1,0,43,0,2,192,0,-1--1--1,|12||0-0-0,1|(452,798)|
1,28,12,20,1,0,43,0,2,192,0,-1--1--1,|12||0-0-0,1|(875,588)|
1,29,1,15,1,0,43,0,2,192,0,-1--1--1,|12||0-0-0,1|(1174,452)|
1,30,1,11,1,0,43,0,2,64,0,-1--1--1,|12||0-0-0,1|(1370,577)|
10,31,"time to remove halon-1301 from the troposphere",1483,750,66,28,8,3,0,0,0,0,0,0
1,32,31,11,1,0,43,0,2,192,0,-1--1--1,|12||0-0-0,1|(1463,687)|
10,33,"% of halon-1301 transported to the stratosphere",1167,719,57,28,8,3,0,0,0,0,0,0
1,34,33,16,1,0,43,0,2,192,0,-1--1--1,|12||0-0-0,1|(1109,613)|
1,35,33,10,1,0,45,0,2,192,0,-1--1--1,|12||0-0-0,1|(1197,655)|
10,36,effectivness of Br in destroying ozone relative to Cl,573,304,79,28,8,3,0,0,0,0,0,0
10,37,"amount of ozone that can be destroyed by Br from halon-
1301",360,303,105,30,8,3,0,26,0,0,0,0,0-0-0,0-0-0,|14|B|255-0-0
1,38,17,37,1,0,43,0,2,192,0,-1--1--1,|14||255-0-0,1|(445,425)|
1,39,36,37,1,0,43,0,2,192,0,-1--1--1,|14||255-0-0,1|(474,271)|
10,40,time for ODS to move from the troposhere to the
stratosphere,996,673,93,28,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
```

1,41,40,16,1,0,0,0,0,64,0,-1--1--1,,1|(1013,606)|
10,42,number of stratospheric ozone molecules destroyed by one Cl atom in a
year,177,388,100,28,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
1,43,42,37,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(216,329)|
10,44,Cl lifetime,401,615,41,11,8,2,1,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
10,45,Br lifetime,312,592,33,11,8,3,0,0,0,0,0,0
1,46,45,24,1,0,45,0,2,64,0,-1--1--1,|12||128-128-128,1|(312,664)|
10,47,Political willingness to adjust ODS emission policy,2257,797,73,28,8,2,0,3,-
1,0,0,0,128-128-128,0-0-0,|12||128-128-128
10,48,relative attention fraction of policy makers to ozone related cancer
risks,1704,137,97,28,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
10,49,"% of ODS replacement technology puzzles solved",1973,94,80,28,8,2,0,3,-
1,0,0,0,128-128-128,0-0-0,|12||128-128-128
10,50,"Annual halon-1301 emission rate",2099,455,75,43,3,3,0,0,0,0,0,0
12,51,48,2424,453,10,8,0,3,0,0,-1,0,0,0
1,52,54,50,4,0,0,22,0,0,0,-1--1--1,,1|(2224,451)|
1,53,54,51,100,0,0,22,2,0,0,-1--1--1,|12||128-128-128,1|(2350,451)|
11,54,48,2281,451,6,8,34,3,0,0,1,0,0,0
10,55,"increase in yearly halon-1301 emissions",2281,493,69,19,40,3,0,0,-1,0,0,0
10,56,"desired annual industry growth in halon-1301
emissions",2473,632,81,28,8,3,0,0,0,0,0,0
1,57,56,55,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(2303,560)|
10,58,"senstivity of Halon-1301 emission reduction to available replacement
technology",2149,251,93,34,8,3,0,0,0,0,0,0
10,59,"min political willingness to restrict halon-1301
emissions",2015,803,81,28,8,3,0,0,0,0,0,0
1,60,50,54,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(2202,398)|
10,61,"halon-1301 molecules per thousand ton",1617,399,74,28,8,3,0,0,0,0,0,0
10,62,"annual decrease in halon-1301 emissions",1868,263,69,19,8,3,0,0,0,0,0,0
1,63,48,62,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1731,208)|
1,64,49,62,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1894,165)|
1,65,58,62,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1960,249)|
1,66,61,5,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1497,442)|
10,67,"number of Br atoms in one molecule of halon-1301",774,836,84,19,8,3,0,0,0,0,0,0
12,68,48,622,517,10,8,0,3,0,0,-1,0,0,0
1,69,19,68,4,0,0,22,0,0,0,-1--1--1,,1|(693,516)|
1,70,26,19,1,0,45,0,2,64,0,-1--1--1,|12||128-128-128,1|(754,443)|
12,71,48,788,702,10,8,0,3,0,0,-1,0,0,0
1,72,74,17,4,0,0,22,0,0,0,-1--1--1,,1|(633,702)|
1,73,74,71,100,0,0,22,0,0,0,-1--1--1,,1|(736,702)|
11,74,48,687,702,6,8,34,3,0,0,1,0,0,0
10,75,"release of Br from halon-1301 conversion",687,729,73,19,40,3,0,0,-1,0,0,0
1,76,20,74,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(689,644)|
1,77,67,75,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(679,771)|
10,78,Time,2465,516,26,11,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
1,79,78,55,1,0,0,0,0,0,0,-1--1--1,,1|(2370,544)|

1,80,50,6,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1783,603)|
12,81,48,1776,455,10,8,0,3,0,0,-1,0,0,0
1,82,84,81,4,0,0,22,0,0,0,-1--1--1,,1|(1842,455)|
1,83,84,50,100,0,0,22,0,0,0,-1--1--1,,1|(1967,455)|
11,84,48,1905,455,6,8,34,3,0,0,1,0,0,0
10,85,"decrease in yearly halon-1301",1905,482,57,19,40,3,0,0,-1,0,0,0
1,86,50,84,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1985,395)|
1,87,62,84,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(1850,411)|
10,88,"halon-1301 political willingness switch",2124,667,64,19,8,3,0,0,0,0,0,0
1,89,59,88,1,0,0,0,0,64,0,-1--1--1,,1|(2020,701)|
1,90,47,88,1,0,0,0,0,64,0,-1--1--1,,1|(2243,725)|
1,91,88,55,1,0,0,0,0,64,0,-1--1--1,,1|(2213,580)|
1,92,88,85,1,0,0,0,0,64,0,-1--1--1,,1|(1961,593)|
10,93,time to reduce emissions,1716,503,50,19,8,2,0,3,-1,0,0,0,128-128-128,0-0-
0,|12||128-128-128
1,94,93,85,1,0,45,0,2,192,0,-1--1--1,|12||128-128-128,1|(1836,536)|
\\\---/// Sketch information - do not modify anything except names
V300 Do not put anything below this section - it will be ignored
*Halon-1211
$192-192-192,0,Times New Roman|12||0-0-0|0-0-0|0-0-255|-1--1--1|-1--1--1|96,96
10,1,"Halon-1211 in the troposphere",1430,446,67,47,3,3,0,0,0,0,0,0
12,2,48,1683,440,10,8,0,3,0,0,-1,0,0,0
1,3,5,1,4,0,0,22,0,0,0,-1--1--1,,1|(1538,440)|
1,4,5,2,100,0,0,22,0,0,0,-1--1--1,,1|(1632,440)|
11,5,48,1585,440,6,8,34,3,0,0,1,0,0,0
10,6,"halon-1211 emissions",1585,474,37,19,40,3,0,0,-1,0,0,0
12,7,48,1431,654,10,8,0,3,0,0,-1,0,0,0
1,8,10,7,4,0,0,22,0,0,0,-1--1--1,,1|(1431,611)|
1,9,10,1,100,0,0,22,0,0,0,-1--1--1,,1|(1431,528)|
11,10,48,1431,570,8,6,33,3,0,0,4,0,0,0
10,11,"removal of halon-1211 from the troposphere",1521,570,73,19,40,3,0,0,-1,0,0,0
10,12,"Halon-1211 in the stratosphere",1099,448,73,48,3,3,0,0,0,0,0,0
1,13,15,12,4,0,0,22,0,0,0,-1--1--1,,1|(1221,447)|
1,14,15,1,100,0,0,22,0,0,0,-1--1--1,,1|(1322,447)|
11,15,3660,1276,447,6,8,34,3,0,0,1,0,0,0
10,16,"transport of halon-1211 to the stratosphere",1276,490,76,19,40,3,0,0,-1,0,0,0
10,17,"Reactive Br in the stratosphere due to halon-1211",702,256,77,50,3,3,0,0,0,0,0,0
1,18,19,12,100,0,0,22,0,0,0,-1--1--1,,1|(972,448)|
11,19,3692,912,448,6,8,34,3,0,0,1,0,0,0
10,20,"chemical conversion of halon-1211",912,475,64,19,40,3,0,0,-1,0,0,0
12,21,48,379,262,10,8,0,3,0,0,-1,0,0,0
1,22,24,21,4,0,0,22,0,0,0,-1--1--1,,1|(447,265)|
1,23,24,17,100,0,0,22,0,0,0,-1--1--1,,1|(571,265)|
11,24,48,511,265,6,8,34,3,0,0,1,0,0,0
10,25,"removal of Br produced from halon-1211 from the
stratosphere",511,309,89,36,40,3,0,0,-1,0,0,0

10,26,"halon-1211 atmospheric lifetime",717,515,63,19,8,3,0,0,0,0,0,0
1,27,17,25,1,0,43,0,2,192,0,-1--1--1,|12||0-0-0,1|(617,350)|
1,28,12,20,1,0,43,0,2,192,0,-1--1--1,|12||0-0-0,1|(1027,520)|
1,29,1,15,1,0,43,0,2,192,0,-1--1--1,|12||0-0-0,1|(1326,378)|
1,30,1,11,1,0,43,0,2,64,0,-1--1--1,|12||0-0-0,1|(1522,503)|
10,31,"time to remove halon-1211 from the troposphere",1635,676,66,28,8,3,0,0,0,0,0,0
1,32,31,11,1,0,43,0,2,192,0,-1--1--1,|12||0-0-0,1|(1615,613)|
10,33,"% of halon-1211 transported to the stratosphere",1319,645,57,28,8,3,0,0,0,0,0,0
1,34,33,16,1,0,43,0,2,192,0,-1--1--1,|12||0-0-0,1|(1261,539)|
1,35,33,10,1,0,45,0,2,192,0,-1--1--1,|12||0-0-0,1|(1349,581)|
10,36,"amount of ozone that can be destroyed by Br and Cl from halon-
1211",381,480,105,30,8,3,0,26,0,0,0,0,0-0-0,0-0-0,|14|B|255-0-0
1,37,17,36,1,0,43,0,2,192,0,-1--1--1,|14||255-0-0,1|(641,401)|
10,38,time for ODS to move from the troposhere to the
stratosphere,1148,599,93,28,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
1,39,38,16,1,0,0,0,0,64,0,-1--1--1,,1|(1165,532)|
10,40,number of stratospheric ozone molecules destroyed by one Cl atom in a
year,175,368,100,28,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
1,41,40,36,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(324,406)|
10,42,Br lifetime,492,142,42,11,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
1,43,42,24,1,0,45,0,2,64,0,-1--1--1,|12||128-128-128,1|(474,195)|
10,44,Political willingness to adjust ODS emission policy,2153,746,73,28,8,2,0,3,-
1,0,0,0,128-128-128,0-0-0,|12||128-128-128
10,45,relative attention fraction of policy makers to ozone related cancer
risks,1845,67,97,28,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
10,46,"% of ODS replacement technology puzzles solved",2114,24,80,28,8,2,0,3,-
1,0,0,0,128-128-128,0-0-0,|12||128-128-128
10,47,"Annual halon-1211 emission rate",2257,449,73,45,3,3,0,0,0,0,0,0
12,48,48,2584,445,10,8,0,3,0,0,-1,0,0,0
1,49,51,47,4,0,0,22,0,0,0,-1--1--1,,1|(2382,443)|
1,50,51,48,100,0,0,22,2,0,0,-1--1--1,|12||128-128-128,1|(2510,443)|
11,51,48,2441,443,6,8,34,3,0,0,1,0,0,0
10,52,"increase yearly halon-1211 emission rate",2441,485,66,28,40,3,0,0,-1,0,0,0
10,53,"desired annual industry growth in halon-1211
emissions",2624,607,72,28,8,3,0,0,0,0,0,0
1,54,53,52,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(2481,542)|
10,55,"senstivity of Halon-1211 emission reduction to available replacement
technology",2289,181,92,34,8,3,0,0,0,0,0,0
10,56,"min political willingness to restrict halon-1211
emissions",2359,740,81,28,8,3,0,0,0,0,0,0
1,57,47,51,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(2362,390)|
10,58,"halon-1211 molecules per thousand ton",1758,329,70,19,8,3,0,0,0,0,0,0
10,59,"annual decrease in halon-1211 emissions",2009,193,75,19,8,3,0,0,0,0,0,0
1,60,45,59,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1872,138)|
1,61,46,59,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(2035,95)|
1,62,55,59,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(2101,179)|

1,63,58,5,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1621,361)|
10,64,effectivness of Br in destroying ozone relative to Cl,158,611,79,28,8,2,0,3,-
1,0,0,0,128-128-128,0-0-0,|12||128-128-128
1,65,64,36,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(277,578)|
10,66,"number of Br atoms in one molecule of halon-
1211",1094,160,84,19,8,3,0,0,0,0,0,0
10,67,"Reactive Cl in the stratosphere due to halon-1211",699,693,78,47,3,3,0,0,0,0,0,0
12,68,48,967,695,10,8,0,3,0,0,-1,0,0,0
1,69,71,67,4,0,0,22,0,0,0,-1--1--1,,1|(823,695)|
1,70,71,68,100,0,0,22,0,0,0,-1--1--1,,1|(919,695)|
11,71,48,874,695,6,8,34,3,0,0,1,0,0,0
10,72,"release of Cl from halon-1211 conversion",874,734,80,31,40,3,0,0,-1,0,0,0
12,73,48,408,692,10,8,0,3,0,0,-1,0,0,0
1,74,76,73,4,0,0,22,0,0,0,-1--1--1,,1|(470,692)|
1,75,76,67,100,0,0,22,0,0,0,-1--1--1,,1|(577,692)|
11,76,48,527,692,6,8,34,3,0,0,1,0,0,0
10,77,"removal of Cl produced from halon-1211 from the
stratosphere",527,745,83,45,40,3,0,0,-1,0,0,0
1,78,67,77,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(653,779)|
10,79,Cl lifetime,441,601,41,11,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
1,80,79,76,1,0,45,0,2,64,0,-1--1--1,|12||128-128-128,1|(467,647)|
1,81,67,36,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(442,546)|
12,82,48,773,447,10,8,0,3,0,0,-1,0,0,0
1,83,19,82,4,0,0,22,0,0,0,-1--1--1,,1|(845,448)|
12,84,48,969,250,10,8,0,3,0,0,-1,0,0,0
1,85,87,17,4,0,0,22,0,0,0,-1--1--1,,1|(821,250)|
1,86,87,84,100,0,0,22,0,0,0,-1--1--1,,1|(917,250)|
11,87,48,869,250,6,8,34,3,0,0,1,0,0,0
10,88,"release of Br from halon-1211 conversion",869,277,73,19,40,3,0,0,-1,0,0,0
1,89,26,20,1,0,45,0,2,64,0,-1--1--1,|12||128-128-128,1|(812,516)|
1,90,19,88,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(900,353)|
1,91,20,71,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(872,598)|
1,92,66,87,1,0,0,0,0,64,0,-1--1--1,,1|(937,182)|
10,93,"number of Cl atoms in one molecule of halon-
1211",1064,823,84,19,8,3,0,0,0,0,0,0
1,94,93,72,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(924,804)|
10,95,Time,2621,505,26,11,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
1,96,95,52,1,0,0,0,0,0,0,-1--1--1,,1|(2539,525)|
10,97,"halon-1211 political willingness switch",2242,620,64,19,8,3,0,0,0,0,0,0
12,98,48,1979,448,10,8,0,3,0,0,-1,0,0,0
1,99,101,98,4,0,0,22,0,0,0,-1--1--1,,1|(2034,448)|
1,100,101,47,100,0,0,22,0,0,0,-1--1--1,,1|(2138,448)|
11,101,48,2086,448,6,8,34,3,0,0,1,0,0,0
10,102,"decrease yearly halon-1211 emission rate",2086,484,66,28,40,3,0,0,-1,0,0,0
1,103,47,101,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(2178,383)|
1,104,44,97,1,0,0,0,0,64,0,-1--1--1,,1|(2151,670)|

1,105,56,97,1,0,0,0,0,64,0,-1--1--1,,1|(2341,666)|
1,106,97,102,1,0,0,0,0,64,0,-1--1--1,,1|(2112,555)|
1,107,97,52,1,0,0,0,0,64,0,-1--1--1,,1|(2369,573)|
1,108,47,6,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1904,590)|
1,109,59,101,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(2033,362)|
10,110,time to reduce emissions,1892,495,50,19,8,2,0,3,-1,0,0,0,128-128-128,0-0-
0,|12||128-128-128
1,111,110,102,1,0,0,0,0,64,0,-1--1--1,,1|(1997,528)|
\\\---/// Sketch information - do not modify anything except names
V300 Do not put anything below this section - it will be ignored
*Anthropogenic methyl bromide
$192-192-192,0,Times New Roman|12||0-0-0|0-0-0|0-0-255|-1--1--1|-1--1--1|96,96
10,1,Anthropogenic methyl bromide in the troposphere,1254,515,67,47,3,3,0,0,0,0,0,0
12,2,48,1507,509,10,8,0,3,0,0,-1,0,0,0
1,3,5,1,4,0,0,22,0,0,0,-1--1--1,,1|(1362,509)|
1,4,5,2,100,0,0,22,0,0,0,-1--1--1,,1|(1456,509)|
11,5,48,1409,509,6,8,34,3,0,0,1,0,0,0
10,6,methyl bromide emissions,1409,543,49,19,40,3,0,0,-1,0,0,0
12,7,48,1255,723,10,8,0,3,0,0,-1,0,0,0
1,8,10,7,4,0,0,22,0,0,0,-1--1--1,,1|(1255,680)|
1,9,10,1,100,0,0,22,0,0,0,-1--1--1,,1|(1255,597)|
11,10,48,1255,639,8,6,33,3,0,0,4,0,0,0
10,11,removal of anthropogenic methyl bromide from the
troposphere,1345,639,81,28,40,3,0,0,-1,0,0,0
10,12,Anthropogenic methyl bromide in the stratosphere,923,511,73,48,3,3,0,0,0,0,0,0
1,13,15,12,4,0,0,22,0,0,0,-1--1--1,,1|(1045,516)|
1,14,15,1,100,0,0,22,0,0,0,-1--1--1,,1|(1146,516)|
11,15,3468,1100,516,6,8,34,3,0,0,1,0,0,0
10,16,transport of anthropogenic methyl bromide to the
stratosphere,1100,559,84,28,40,3,0,0,-1,0,0,0
10,17,Reactive Br in the stratosphere due to anthropogenic methyl
bromide,515,730,77,50,3,3,0,0,0,0,0,0
1,18,19,12,100,0,0,22,0,0,0,-1--1--1,,1|(796,511)|
11,19,2844,736,511,6,8,34,3,0,0,1,0,0,0
10,20,chemical conversion of anthropogenic methyl bromide,736,545,72,28,40,3,0,0,-
1,0,0,0
12,21,48,214,733,10,8,0,3,0,0,-1,0,0,0
1,22,24,21,4,0,0,22,0,0,0,-1--1--1,,1|(268,734)|
1,23,24,17,100,0,0,22,0,0,0,-1--1--1,,1|(381,734)|
11,24,48,318,734,6,8,34,3,0,0,1,0,0,0
10,25,removal of Br produced from anthropogenic methyl bromide from the
stratosphere,318,770,96,28,40,3,0,0,-1,0,0,0
10,26,methyl bormide atmospheric lifetime,814,367,63,19,8,3,0,0,0,0,0,0
1,27,17,25,1,0,43,0,2,192,0,-1--1--1,|12||0-0-0,1|(444,848)|
1,28,12,20,1,0,43,0,2,192,0,-1--1--1,|12||0-0-0,1|(851,583)|
1,29,1,15,1,0,43,0,2,192,0,-1--1--1,|12||0-0-0,1|(1150,447)|

1,30,1,11,1,0,43,0,2,64,0,-1--1--1,|12||0-0-0,1|(1346,572)|
10,31,time to remove methyl bromide from the
troposphere,1459,745,70,28,8,3,0,0,0,0,0,0
1,32,31,11,1,0,43,0,2,192,0,-1--1--1,|12||0-0-0,1|(1439,682)|
10,33,"% of methyl bromide transported to the
stratosphere",1143,714,67,28,8,3,0,0,0,0,0,0
1,34,33,16,1,0,43,0,2,192,0,-1--1--1,|12||0-0-0,1|(1085,608)|
1,35,33,10,1,0,45,0,2,192,0,-1--1--1,|12||0-0-0,1|(1173,650)|
10,36,amount of ozone that can be destroyed by Br from anthropogenic methyl
bromide,359,322,117,40,8,3,0,26,0,0,0,0,0-0-0,0-0-0,|14|B|255-0-0
1,37,17,36,1,0,43,0,2,192,0,-1--1--1,|14||255-0-0,1|(479,440)|
10,38,time for ODS to move from the troposhere to the
stratosphere,972,668,93,28,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
1,39,38,16,1,0,0,0,0,64,0,-1--1--1,,1|(989,601)|
10,40,number of stratospheric ozone molecules destroyed by one Cl atom in a
year,163,392,100,28,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
1,41,40,36,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(202,333)|
10,42,Br lifetime,305,616,42,11,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
1,43,42,24,1,0,45,0,2,64,0,-1--1--1,|12||128-128-128,1|(311,685)|
10,44,Political willingness to adjust ODS emission policy,1962,914,73,28,8,2,0,3,-
1,0,0,0,128-128-128,0-0-0,|12||128-128-128
10,45,relative attention fraction of policy makers to ozone related cancer
risks,1687,175,97,28,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
10,46,"% of ODS replacement technology puzzles solved",1956,132,80,28,8,2,0,3,-
1,0,0,0,128-128-128,0-0-0,|12||128-128-128
10,47,Annual anthropogenic methyl bromide emission
rate,2074,537,66,47,3,3,0,0,0,0,0,0
12,48,48,2408,531,10,8,0,3,0,0,-1,0,0,0
1,49,51,47,4,0,0,22,0,0,0,-1--1--1,,1|(2199,529)|
1,50,51,48,100,0,0,22,2,0,0,-1--1--1,|12||128-128-128,1|(2334,529)|
11,51,48,2265,529,6,8,34,3,0,0,1,0,0,0
10,52,increase in yearly methyl bromide emissions,2265,571,77,19,40,3,0,0,-1,0,0,0
10,53,desired annual industry growth in methyl bromide
emissions,2420,706,80,28,8,3,0,0,0,0,0,0
10,54,annual decrease in anthropogenic methyl bromide
emissions,1870,292,68,28,8,3,0,0,0,0,0,0
1,55,46,54,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(1936,206)|
1,56,45,54,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1758,188)|
1,57,53,52,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(2302,641)|
10,58,sensitivity of anthropogenic methyl bromide emission reduction to replacement
technology availability,2131,292,101,46,8,3,0,0,0,0,0,0
1,59,58,54,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1974,332)|
10,60,min political willingness to restrict anthropogenic methyl bromide
emissions,2162,911,91,28,8,3,0,0,0,0,0,0
10,61,methyl bromide molecules per thousand ton,1560,380,74,28,8,3,0,0,0,0,0,0
1,62,61,5,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1454,429)|

10,63,effectivness of Br in destroying ozone relative to Cl,594,358,79,28,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
1,64,63,36,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(510,309)|
10,65,number of Br atoms in one molecule of methyl bromide,840,872,84,28,8,3,0,0,0,0,0,0
12,66,48,609,510,10,8,0,3,0,0,-1,0,0,0
1,67,19,66,4,0,0,22,0,0,0,-1--1--1,,1|(675,511)|
12,68,48,776,737,10,8,0,3,0,0,-1,0,0,0
1,69,71,17,4,0,0,22,0,0,0,-1--1--1,,1|(637,736)|
1,70,71,68,100,0,0,22,0,0,0,-1--1--1,,1|(730,736)|
11,71,48,688,736,6,8,34,3,0,0,1,0,0,0
10,72,release of Br from anthropogenic methyl bormide conversion,688,772,68,28,40,3,0,0,-1,0,0,0
1,73,26,19,1,0,45,0,2,64,0,-1--1--1,|12||128-128-128,1|(728,450)|
1,74,20,71,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(680,664)|
1,75,65,72,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(700,835)|
10,76,Time,2428,599,26,11,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
1,77,76,52,1,0,0,0,0,0,0,-1--1--1,,1|(2338,612)|
10,78,methyl bromide political willingness switch,2054,756,75,19,8,3,0,0,0,0,0,0
1,79,44,78,1,0,0,0,0,64,0,-1--1--1,,1|(1961,821)|
1,80,60,78,1,0,0,0,0,64,0,-1--1--1,,1|(2159,824)|
12,81,48,1737,527,10,8,0,3,0,0,-1,0,0,0
1,82,84,81,4,0,0,22,0,0,0,-1--1--1,,1|(1809,527)|
1,83,84,47,100,0,0,22,0,0,0,-1--1--1,,1|(1945,527)|
11,84,48,1877,527,6,8,34,3,0,0,1,0,0,0
10,85,decrease in yearly methyl bromide emissions,1877,563,57,28,40,3,0,0,-1,0,0,0
1,86,47,6,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1802,689)|
1,87,47,84,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(1984,444)|
1,88,78,52,1,0,0,0,0,64,0,-1--1--1,,1|(2198,670)|
1,89,78,85,1,0,0,0,0,64,0,-1--1--1,,1|(1897,681)|
1,90,54,84,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(1821,437)|
10,91,time to reduce emissions,1662,571,50,19,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
1,92,91,85,1,0,45,0,2,192,0,-1--1--1,|12||128-128-128,1|(1751,602)|
\\\---/// Sketch information - do not modify anything except names
V300 Do not put anything below this section - it will be ignored
*HCFC-22
$192-192-192,0,Times New Roman|12||0-0-0|0-0-0|0-0-255|-1--1--1|-1--1--1|96,96
10,1,"HCFC-22 in the troposphere",1140,581,67,47,3,3,0,0,0,0,0,0
12,2,48,1393,575,10,8,0,3,0,0,-1,0,0,0
1,3,5,1,4,0,0,22,0,0,0,-1--1--1,,1|(1248,575)|
1,4,5,2,100,0,0,22,0,0,0,-1--1--1,,1|(1342,575)|
11,5,48,1295,575,6,8,34,3,0,0,1,0,0,0
10,6,"HCFC-22 emissions",1295,609,34,19,40,3,0,0,-1,0,0,0
12,7,48,1141,789,10,8,0,3,0,0,-1,0,0,0
1,8,10,7,4,0,0,22,0,0,0,-1--1--1,,1|(1141,746)|

1,9,10,1,100,0,0,22,0,0,0,-1--1--1,,1|(1141,663)|
11,10,48,1141,705,8,6,33,3,0,0,4,0,0,0
10,11,"removal of HCFC-22 from the troposphere",1231,705,70,19,40,3,0,0,-1,0,0,0
10,12,"HCFC-22 in the stratosphere",809,577,73,48,3,3,0,0,0,0,0,0
1,13,15,12,4,0,0,22,0,0,0,-1--1--1,,1|(931,582)|
1,14,15,1,100,0,0,22,0,0,0,-1--1--1,,1|(1032,582)|
11,15,3436,986,582,6,8,34,3,0,0,1,0,0,0
10,16,"transport of HCFC-22 to the stratosphere",986,609,73,19,40,3,0,0,-1,0,0,0
10,17,"Reactive Cl in the stratosphere due to HCFC-22",393,787,77,50,3,3,0,0,0,0,0,0
1,18,19,12,100,0,0,22,0,0,0,-1--1--1,,1|(682,577)|
11,19,2492,622,577,6,8,34,3,0,0,1,0,0,0
10,20,"reaction of HCFC-22 to form Cl",622,604,70,19,40,3,0,0,-1,0,0,0
12,21,48,125,787,10,8,0,3,0,0,-1,0,0,0
1,22,24,21,4,0,0,22,0,0,0,-1--1--1,,1|(177,787)|
1,23,24,17,100,0,0,22,0,0,0,-1--1--1,,1|(273,787)|
11,24,48,224,787,6,8,34,3,0,0,1,0,0,0
10,25,"removal of Cl produced from HCFC-22 from the
stratosphere",224,836,93,28,40,3,0,0,-1,0,0,0
10,26,"HCFC-22 atmospheric lifetime",625,443,63,19,8,3,0,0,0,0,0,0
1,27,17,25,1,0,43,0,2,192,0,-1--1--1,|12||0-0-0,1|(337,884)|
1,28,12,20,1,0,43,0,2,192,0,-1--1--1,|12||0-0-0,1|(737,649)|
1,29,1,15,1,0,43,0,2,192,0,-1--1--1,|12||0-0-0,1|(1036,513)|
1,30,1,11,1,0,43,0,2,64,0,-1--1--1,|12||0-0-0,1|(1232,638)|
10,31,"time to remove HCFC-22 from the troposphere",1345,811,62,28,8,3,0,0,0,0,0,0
1,32,31,11,1,0,43,0,2,192,0,-1--1--1,|12||0-0-0,1|(1325,748)|
10,33,"% of HCFC-22 transported to the stratosphere",1029,780,57,28,8,3,0,0,0,0,0,0
1,34,33,16,1,0,43,0,2,192,0,-1--1--1,|12||0-0-0,1|(971,674)|
1,35,33,10,1,0,45,0,2,192,0,-1--1--1,|12||0-0-0,1|(1059,716)|
10,36,"amount of ozone that can be destroyed by Cl from HCFC-
22",361,376,105,30,8,3,0,26,0,0,0,0,0-0-0,0-0-0,|14|B|255-0-0
1,37,17,36,1,0,43,0,2,192,0,-1--1--1,|14||255-0-0,1|(332,582)|
10,38,Cl lifetime,176,695,41,11,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
1,39,38,24,1,0,45,0,2,64,0,-1--1--1,|12||128-128-128,1|(191,749)|
10,40,time for ODS to move from the troposhere to the
stratosphere,858,734,93,28,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
1,41,40,16,1,0,0,0,0,64,0,-1--1--1,,1|(875,667)|
10,42,number of stratospheric ozone molecules destroyed by one Cl atom in a
year,178,461,100,28,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
1,43,42,36,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(217,402)|
10,44,Political willingness to adjust ODS emission policy,1823,947,73,28,8,2,0,3,-
1,0,0,0,128-128-128,0-0-0,|12||128-128-128
10,45,relative attention fraction of policy makers to ozone related cancer
risks,1584,260,97,28,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
10,46,"% of ODS replacement technology puzzles solved",1853,217,80,28,8,2,0,3,-
1,0,0,0,128-128-128,0-0-0,|12||128-128-128
10,47,"Annual HCFC-22 emission rate",1906,596,62,38,3,3,0,0,0,0,0,0

12,48,48,2244,599,10,8,0,3,0,0,-1,0,0,0
1,49,51,47,4,0,0,22,0,0,0,-1--1--1,,1|(2031,597)|
1,50,51,48,100,0,0,22,2,0,0,-1--1--1,|12||128-128-128,1|(2170,597)|
11,51,48,2101,597,6,8,34,3,0,0,1,0,0,0
10,52,"increase yearly HCFC-22 emissions",2101,633,66,19,40,3,0,0,-1,0,0,0
10,53,"desired annual industry growth in HCFC-22
emissions",2246,762,72,28,8,3,0,0,0,0,0,0
10,54,"annual decrease in HCFC-22 emissions",1768,358,66,19,8,3,0,0,0,0,0,0
1,55,46,54,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(1833,291)|
1,56,45,54,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1655,273)|
1,57,53,52,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(2116,679)|
10,58,"senstivity of HCFC-22 emission reduction to available replacement
technology",2033,359,96,34,8,3,0,0,0,0,0,0
1,59,58,54,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1894,385)|
10,60,"min political willingness to restrict HCFC-22
emissions",2040,942,81,28,8,3,0,0,0,0,0,0
10,61,"HCFC-22 molecules per thousand ton",1402,386,67,19,8,3,0,0,0,0,0,0
1,62,61,5,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1302,479)|
10,63,"number of Cl atoms in one molecule of HCFC-22",676,910,70,28,8,3,0,0,0,0,0,0
12,64,48,484,576,10,8,0,3,0,0,-1,0,0,0
1,65,19,64,4,0,0,22,0,0,0,-1--1--1,,1|(555,577)|
1,66,26,19,1,0,45,0,2,64,0,-1--1--1,|12||128-128-128,1|(597,525)|
12,67,48,637,791,10,8,0,3,0,0,-1,0,0,0
1,68,70,17,4,0,0,22,0,0,0,-1--1--1,,1|(513,789)|
1,69,70,67,100,0,0,22,0,0,0,-1--1--1,,1|(598,789)|
11,70,48,562,789,6,8,34,3,0,0,1,0,0,0
10,71,"release of Cl from HCFC-22 conversion",562,816,70,19,40,3,0,0,-1,0,0,0
1,72,20,70,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(562,690)|
1,73,63,71,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(561,870)|
10,74,Time,2243,663,26,11,8,2,0,3,-1,0,0,0,128-128-128,0-0-0,|12||128-128-128
1,75,74,52,1,0,0,0,0,0,0,-1--1--1,,1|(2193,677)|
10,76,"HCFC-22 political willingness switch",1913,809,60,19,8,3,0,0,0,0,0,0
1,77,44,76,1,0,0,0,0,64,0,-1--1--1,,1|(1807,861)|
1,78,60,76,1,0,0,0,0,64,0,-1--1--1,,1|(2032,852)|
12,79,48,1604,596,10,8,0,3,0,0,-1,0,0,0
1,80,82,79,4,0,0,22,0,0,0,-1--1--1,,1|(1668,596)|
1,81,82,47,100,0,0,22,0,0,0,-1--1--1,,1|(1789,596)|
11,82,48,1729,596,6,8,34,3,0,0,1,0,0,0
10,83,"decrease yearly HCFC-22 emissions",1729,623,66,19,40,3,0,0,-1,0,0,0
1,84,76,52,1,0,0,0,0,64,0,-1--1--1,,1|(2042,742)|
1,85,76,83,1,0,0,0,0,64,0,-1--1--1,,1|(1761,726)|
1,86,54,82,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1716,474)|
1,87,47,82,1,0,43,0,2,64,0,-1--1--1,|12||128-128-128,1|(1835,536)|
10,88,time to reduce emissions,1556,662,50,19,8,2,0,3,-1,0,0,0,128-128-128,0-0-
0,|12||128-128-128
1,89,88,83,1,0,45,0,2,64,0,-1--1--1,|12||128-128-128,1|(1654,682)|

1,90,47,6,1,0,43,0,2,192,0,-1--1--1,|12||128-128-128,1|(1582,779)|
\\\---/// Sketch information - do not modify anything except names
V300 Do not put anything below this section - it will be ignored
*Actual Data
$192-192-192,0,Times New Roman|12||0-0-0|0-0-0|0-0-255|-1--1--1|-1--1--1|96,96
10,1,"annual CFC-11 emission rate (actual)",101,54,67,19,8,3,0,0,0,0,0,0
10,2,"annual CFC-12 emission rate (actual)",96,144,67,19,8,3,0,0,0,0,0,0
10,3,"annual CFC-113 emission rate (actual)",91,244,67,19,8,3,0,0,0,0,0,0
10,4,"annual HCFC-22 emission rate (actual)",85,341,67,19,8,3,0,0,0,0,0,0
10,5,"% change in global total stratospheric ozone from baseline value (actual)",886,59,79,28,8,3,0,0,0,0,0,0
10,6,"annual Halon-1211 emission rate (actual)",91,432,67,19,8,3,0,0,0,0,0,0
10,7,"annual Halon-1301 emission rate (actual)",94,516,67,19,8,3,0,0,0,0,0,0
10,8,"annual CH3CCl3 production rate (actual)",98,600,74,19,8,3,0,0,0,0,0,0
10,9,"annual CCl4 production rate (actual)",98,691,76,19,8,3,0,0,0,0,0,0
10,10,"annual anthropogenic methyl bromide emission rate (actual)",100,774,90,28,8,3,0,0,0,0,0,0
10,11,"annual CFC-11 emission restrictions (actual)",586,55,64,28,8,3,0,0,0,0,0,0
10,12,"annual CFC-12 emission restrictions (actual)",580,148,64,28,8,3,0,0,0,0,0,0
10,13,"annual CFC-113 emission restrictions (actual)",576,240,64,28,8,3,0,0,0,0,0,0
10,14,"annual HCFC-22 emission restrictions (actual)",584,321,64,28,8,3,0,0,0,0,0,0
10,15,"annual Halon-1211 emission restrictions (actual)",583,412,64,28,8,3,0,0,0,0,0,0
10,16,"annual Halon-1301 emission restrictions (actual)",591,500,64,28,8,3,0,0,0,0,0,0
10,17,"annual CH3CCl3 emission restrictions (actual)",597,587,64,28,8,3,0,0,0,0,0,0
10,18,"annual CCl4 emission restrictions (actual)",601,672,69,19,8,3,0,0,0,0,0,0
10,19,"Annual anthropogenic methyl bromide emission restrictions (actual)",608,756,92,28,8,3,0,0,0,0,0,0
10,20,"stratospheric Cl concentration (actual)",1147,58,69,19,8,3,0,0,0,0,0,0
10,21,"CFC-11 atmospheric concentration (actual)",324,56,69,19,8,3,0,0,0,0,0,0
10,22,"CFC-12 atmospheric concentration (actual)",337,149,69,19,8,3,0,0,0,0,0,0
10,23,"CCl4 atmospheric concentration (actual)",338,695,69,19,8,3,0,0,0,0,0,0
10,24,"CH3CCl3 atmospheric concentration (actual)",333,601,74,19,8,3,0,0,0,0,0,0
10,25,"CFC-113 atmospheric concentration (actual)",323,243,73,19,8,3,0,0,0,0,0,0
10,26,"HCFC-22 atmospheric concentration (actual)",340,337,74,19,8,3,0,0,0,0,0,0
10,27,"Halon-1211 atmospheric concentration (actual)",340,427,80,19,8,3,0,0,0,0,0,0
10,28,"Halon-1301 atmospheric concentration (actual)",317,515,80,19,8,3,0,0,0,0,0,0