

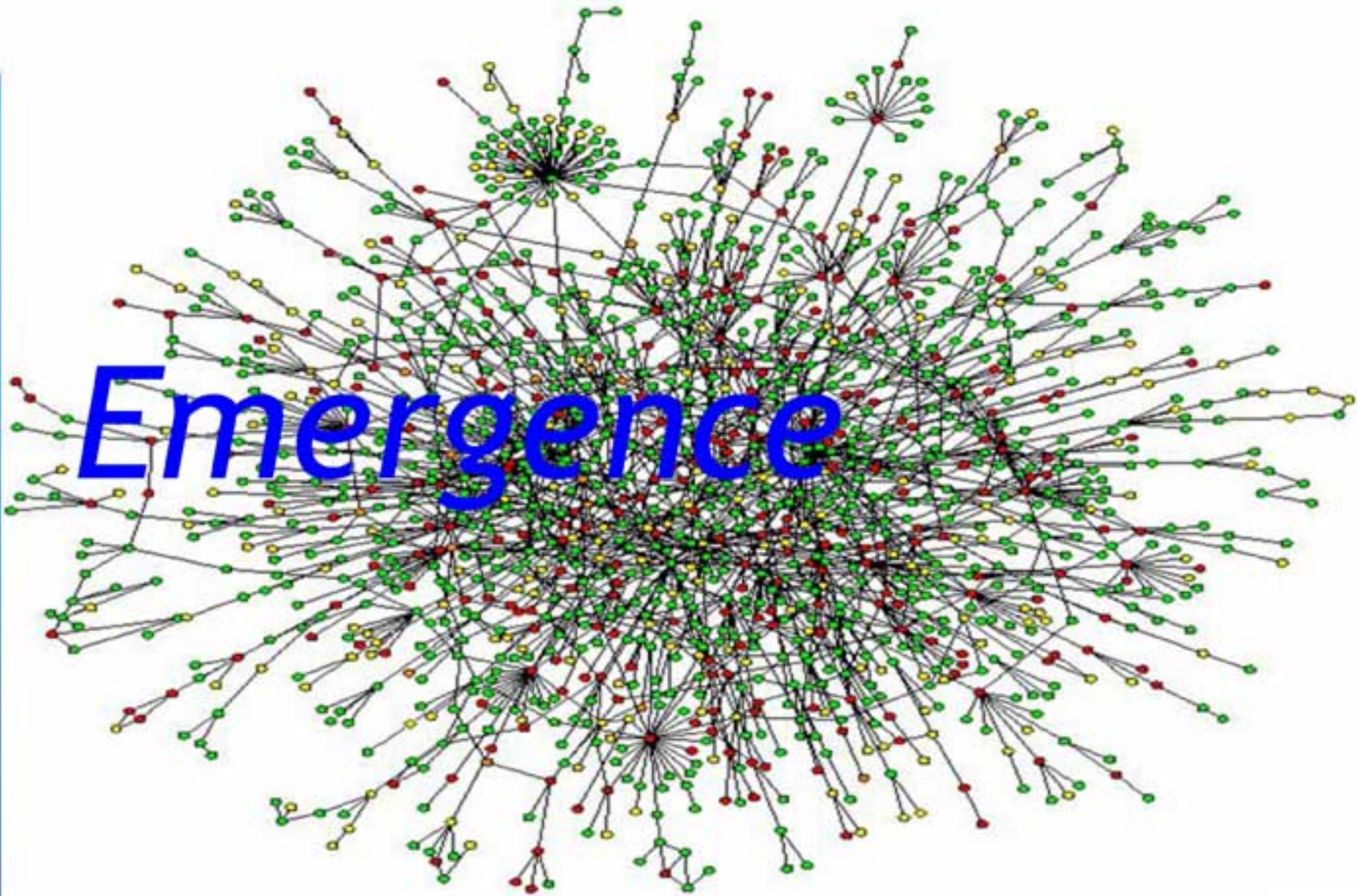
Complexity - So What?

- Complexity quickly gets beyond our capability to “capture”
- Complexity is dynamic and shifts over time
- Dealing with complexity requires attenuation - bounding/abstraction error

Thinking



Action

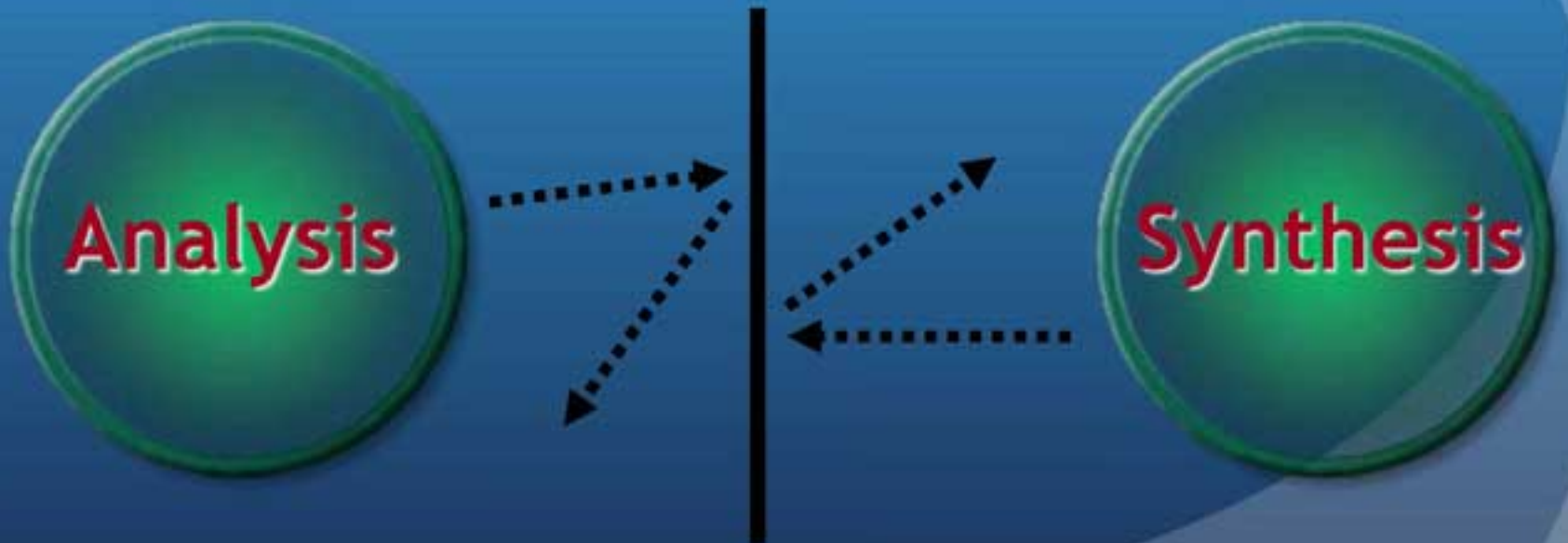


What Is Emergence?

- A characteristic property of complex systems
- Occurs through interaction of system
- Patterns and properties that cannot be ascribed to or deduced from any system elements
- Cannot be predicted or known in advance - Bad engineering?
- Irreducible system level properties that can only be understood retrospectively

Emergence - So What?

- Analysis - breaking apart will not provide understanding of system
- Good vs. Bad emergence
- System design implications





Complex System Problem Domains

Complex System Problem Domain

“Wicked Problems”
and “Messes”

Ambiguous
Boundaries

Fluid
Situation &
Requirements

Divergent
Stakeholders

Ill-defined
Problems

Uncertain
Resources

Dominant
Context

Deep Systemic
Barriers

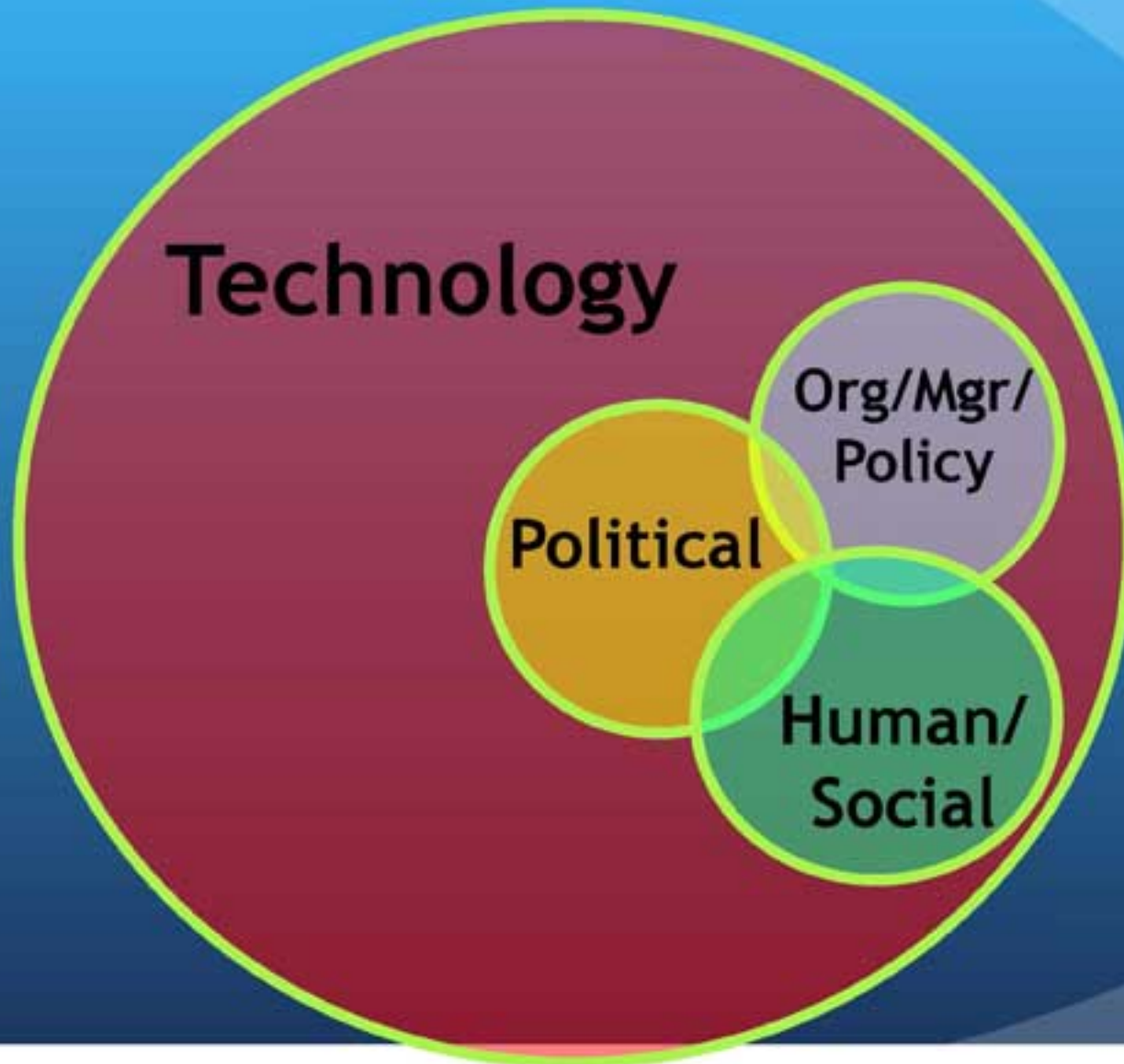
Satisficing
Solutions



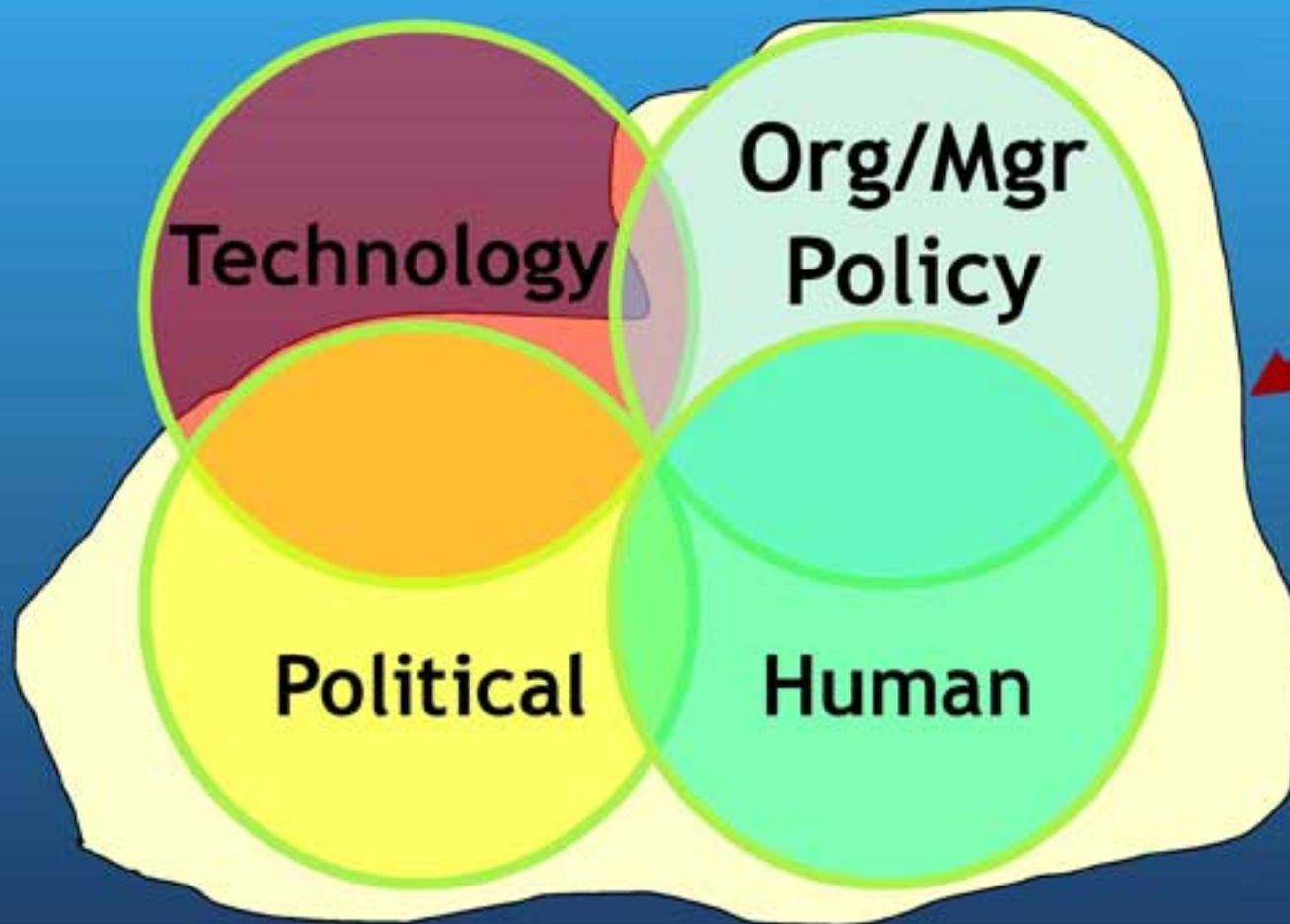
Nature of the Problem Domain

Attribute	Non-complex Problems	Complex Problems
<i>Quantifiable</i>	Yes	Not easily
<i>Structure</i>	Understood	Emergent
<i>Approach</i>	Evident	Not evident
<i>Definition</i>	Clear	Ambiguous
<i>Environment</i>	Static	Dynamic & turbulent
<i>Boundaries</i>	Defined	Ambiguous

Problem Domain



Problem Domain



Context



Romania in the World

How others see it? A Security Issue!

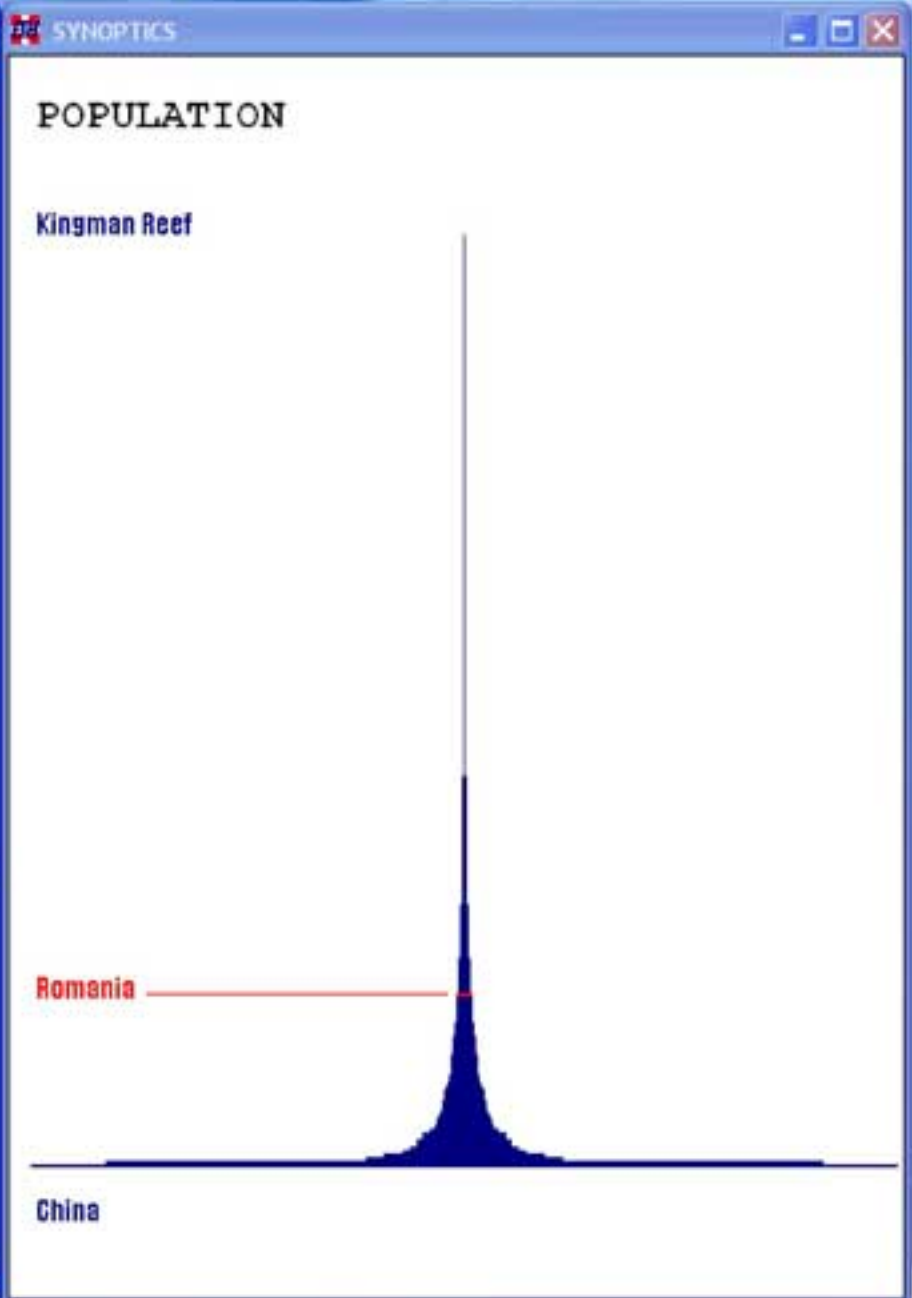
I HAVE SEEN
THE FUTURE
BUT SIGNED A
NONDISCLOSURE.



FEATURE: Population

Files Data File Edit

Sveden:	9,001,774	(July 2005 est.)
Guinea:	9,467,066	(July 2005 est.)
Chad:	9,926,419	(July 2005 est.)
Hungary:	10,006,835	(July 2005 est.)
Tunisia:	10,074,951	(July 2005 est.)
Czech Republic:	10,241,138	(July 2005 est.)
Belarus:	10,300,483	(July 2005 est.)
Belgium:	10,364,388	(July 2005 est.)
Portugal:	10,566,212	(July 2005 est.)
Greece:	10,668,354	(July 2005 est.)
Serbia and Montenegro:	10,829,175	(July 2005 est.)
Senegal:	11,126,832	(July 2005 est.)
Angola:	11,190,786	(July 2005 est.)
Zambia:	11,261,795	
Cuba:	11,346,670	(July 2005 est.)
Niger:	11,665,937	(July 2005 est.)
Malawi:	12,158,924	
Mali:	12,291,529	(July 2005 est.)
Zimbabwe:	12,746,990	
Ecuador:	13,363,593	(July 2005 est.)
Cambodia:	13,607,069	
Burkina Faso:	13,925,313	
Guatemala:	14,655,189	(July 2005 est.)
Kazakhstan:	15,185,844	(July 2005 est.)
Chile:	15,980,912	(July 2005 est.)
Cameroon:	16,380,005	
Netherlands:	16,407,491	(July 2005 est.)
Cote d'Ivoire:	17,298,040	
Madagascar:	18,040,341	(July 2005 est.)
Syria:	18,448,752	
Mozambique:	19,406,703	
Sri Lanka:	20,064,776	
Australia:	20,090,437	(July 2005 est.)
Yemen:	20,727,063	(July 2005 est.)
Ghana:	21,029,853	
Romania:	22,329,977	(July 2005 est.)
Taiwan:	22,894,384	(July 2005 est.)
Korea, North:	22,912,177	(July 2005 est.)
Malaysia:	23,953,136	(July 2005 est.)
Venezuela:	25,375,281	(July 2005 est.)
Iraq:	26,074,906	(July 2005 est.)
Saudi Arabia:	26,417,599	
Uzbekistan:	26,851,195	(July 2005 est.)
Uganda:	27,269,482	
Nepal:	27,676,547	(July 2005 est.)
Peru:	27,925,628	(July 2005 est.)
Afghanistan:	29,928,987	(July 2005 est.)



File Data File Edit

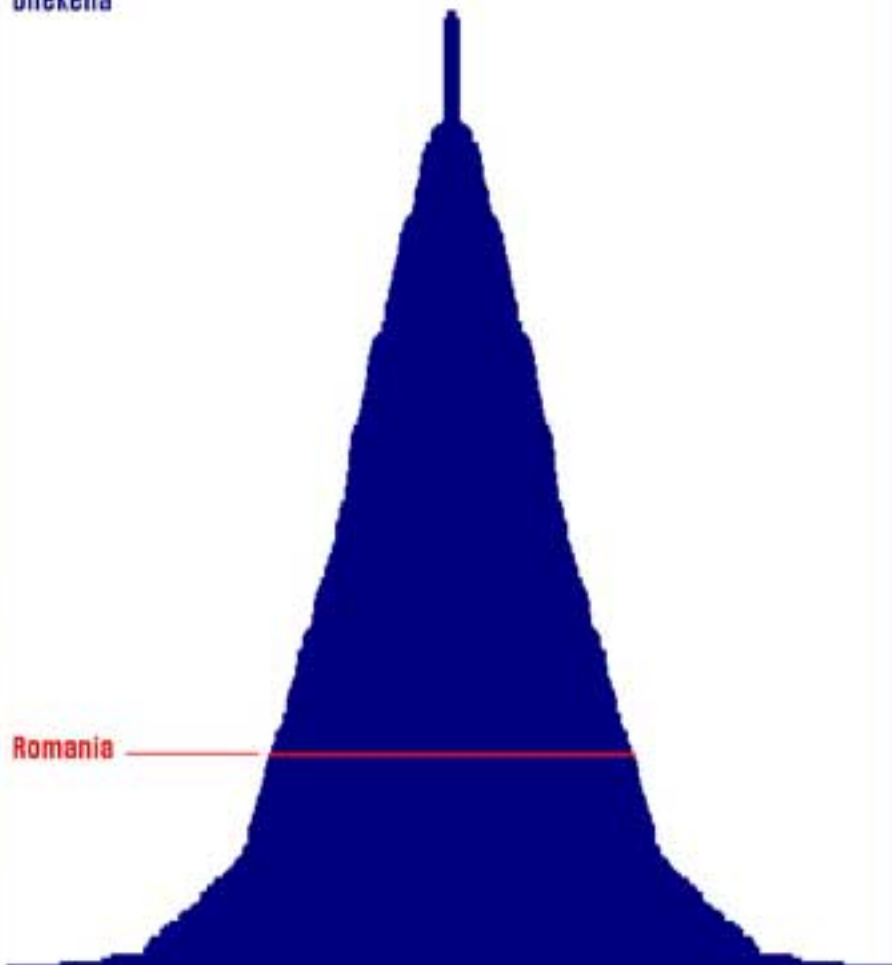
Zambia: copper, cobalt, zinc, lead, coal, emeralds, gold, silver, ur
 Burkina Faso: manganese, limestone, marble; small deposits of gold,
 Mali: gold, phosphates, kaolin, salt, limestone, uranium, gypsum, gr
 Finland: timber, iron ore, copper, lead, zinc, chromite, nickel, gol
 Gambia, The: fish, titanium (rutile and ilmenite), tin, zircon, sill
 Saint Lucia: forests, sandy beaches, minerals (pumice), mineral spri
 Ireland: natural gas, peat, copper, lead, zinc, silver, barite, gyps
 Colombia: petroleum, natural gas, coal, iron ore, nickel, gold, copp
 Johnston Atoll: guano deposits worked until depletion about 1890, te
 Oman: petroleum, copper, asbestos, some marble, limestone, chromium,
 Angola: petroleum, diamonds, iron ore, phosphates, copper, feldspar,
 Niger: uranium, coal, iron ore, tin, phosphates, gold, molybdenum, g
 Estonia: oil shale, peat, phosphorite, clay, limestone, sand, dolomi
 Honduras: timber, gold, silver, copper, lead, zinc, iron ore, antino
 Venezuela: petroleum, natural gas, iron ore, gold, bauxite, other mi
 Lebanon: limestone, iron ore, salt, water-surplus state in a water-d
 Malawi: limestone, arable land, hydropower, unexploited deposits of
 Iran: petroleum, natural gas, coal, chromium, copper, iron ore, lead
 Israel: timber, potash, copper ore, natural gas, phosphate rock, mag
 Rwanda: gold, cassiterite (tin ore), wolframite (tungsten ore), meth
 Nigeria: natural gas, petroleum, tin, iron ore, coal, limestone, nio
 Equatorial Guinea: petroleum, natural gas, timber, gold, bauxite, di
 Cuba: cobalt, nickel, iron ore, chromium, copper, salt, timber, sill
 Cambodia: oil and gas, timber, gemstones, some iron ore, manganese,
 Namibia: diamonds, copper, uranium, gold, lead, tin, lithium, cadmiu
 French Guiana: bauxite, timber, gold (widely scattered), petroleum,
 Tanzania: hydropower, tin, phosphates, iron ore, coal, diamonds, gem
 Chad: petroleum, uranium, natron, kaolin, fish (Lake Chad), gold, li
 Guinea-Bissau: fish, timber, phosphates, bauxite, clay, granite, lim
 Argentina: fertile plains of the pampas, lead, zinc, tin, copper, ir
 Slovakia: brown coal and lignite; small amounts of iron ore, copper
 Indonesia: petroleum, tin, natural gas, nickel, timber, bauxite, cop
 Gabon: petroleum, natural gas, diamond, niobium, manganese, uranium,
 Uzbekistan: natural gas, petroleum, coal, gold, uranium, silver, cop
 Romania: petroleum (reserves declining), timber, natural gas, coal,
 Vietnam: phosphates, coal, manganese, bauxite, chromate, offshore oi
 Bolivia: tin, natural gas, petroleum, zinc, tungsten, antimony, silv
 Albania: petroleum, natural gas, coal, bauxite, chromite, copper, ir
 Djibouti: geothermal areas, gold, clay, granite, limestone, marble,
 Kenya: gold, limestone, soda ash, salt, gemstones, fluorspar, zinc,
 Sweden: iron ore, copper, lead, zinc, gold, silver, tungsten, uraniu
 Nepal: quartz, water, timber, hydropower, scenic beauty, small depos
 Mongolia: oil, coal, copper, molybdenum, tungsten, phosphates, tin,
 Tajikistan: hydropower, some petroleum, uranium, mercury, brown coal
 Egypt: petroleum, natural gas, iron ore, phosphates, manganese, lime
 Madagascar: graphite, chromite, coal, bauxite, salt, quartz, tar san
 Thailand: tin, rubber, natural gas, tungsten, tantalum, timber, lead

NATURAL RESOURCES

Dhekella

Romania

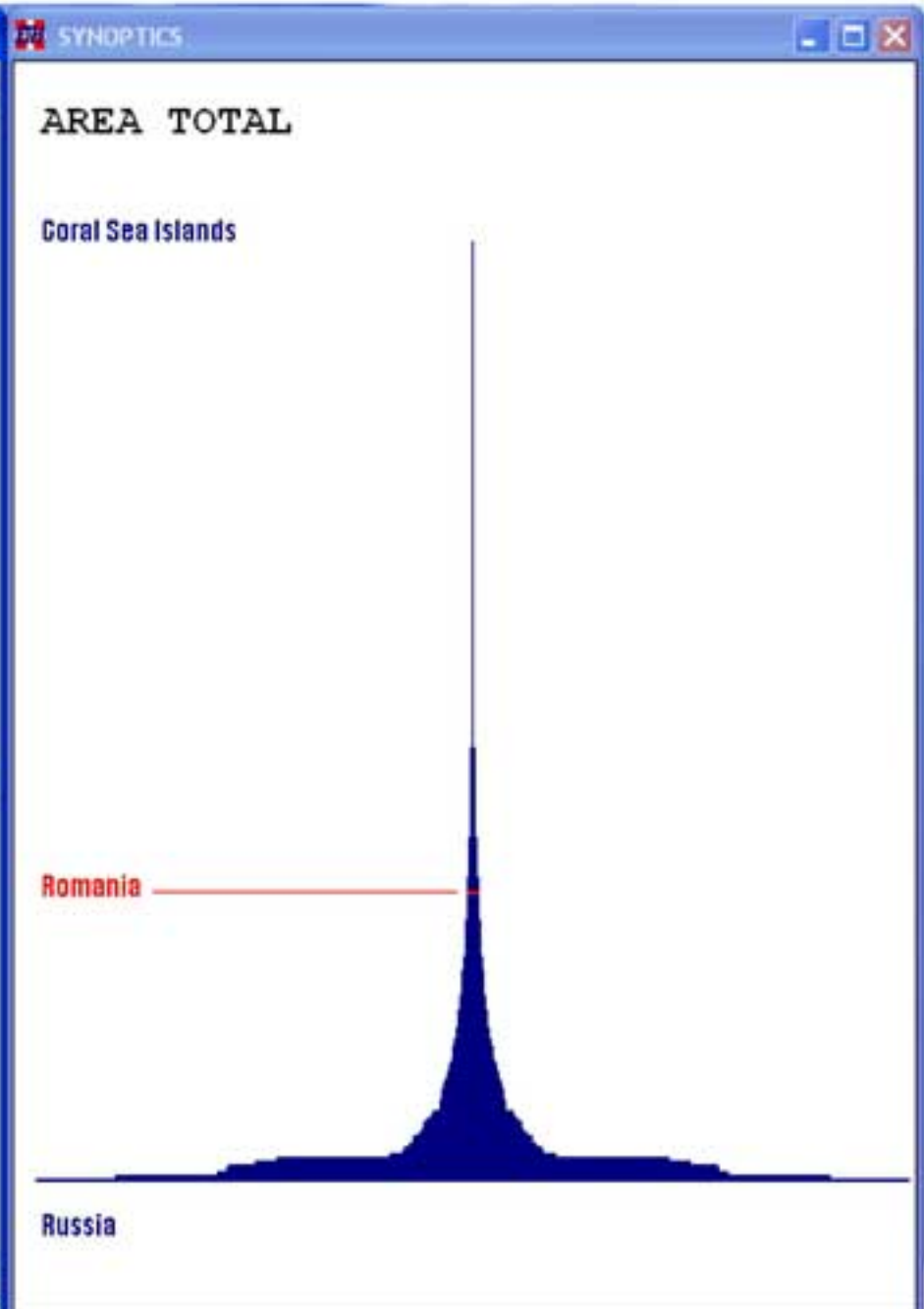
Antarctica



FEATURE: Area total

Files Data File Edit

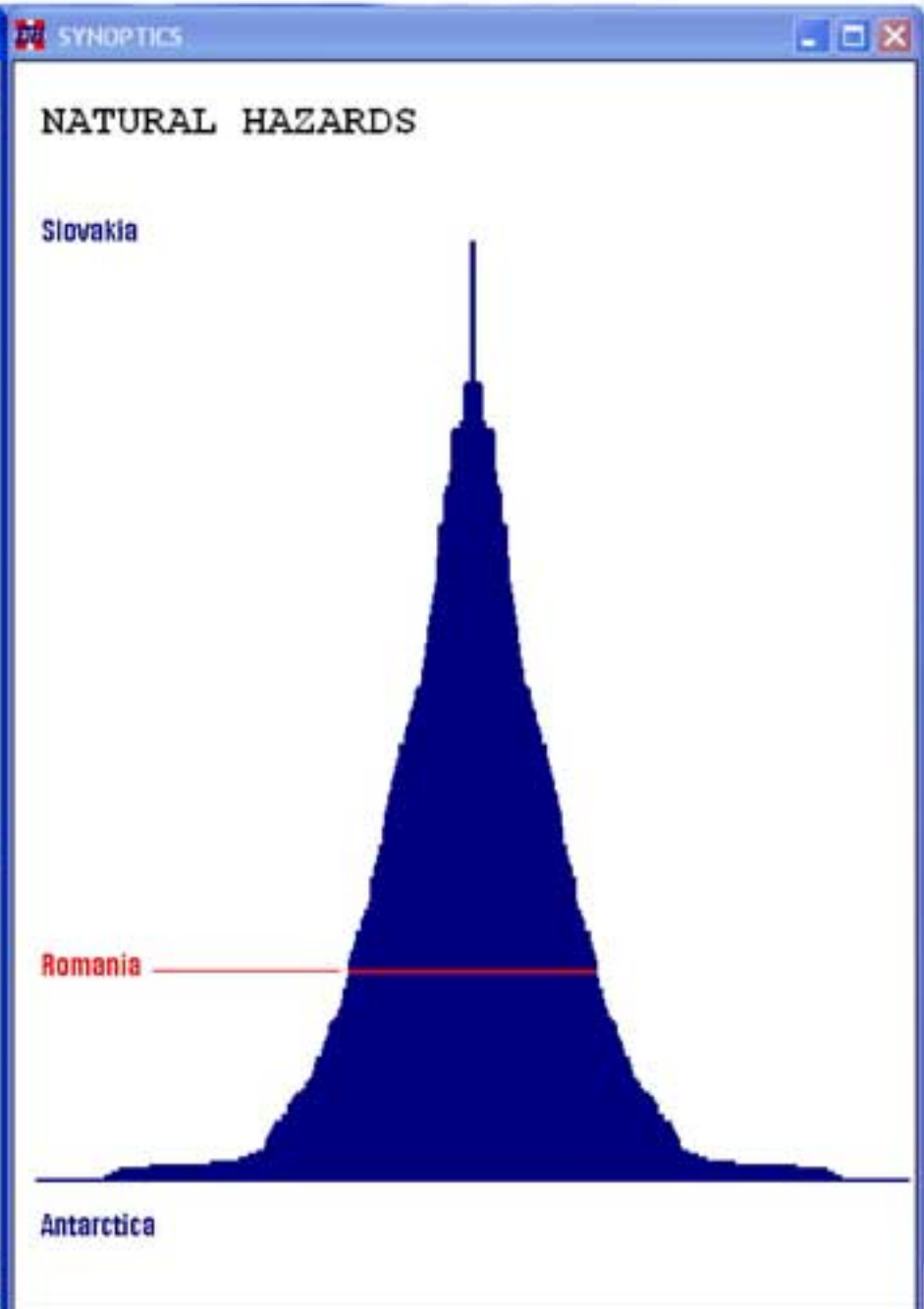
Portugal:	92,391 sq km
Hungary:	93,030 sq km
Korea, South:	98,480 sq km
Serbia and Montenegro:	102,350 sq km
Iceland:	103,000 sq km
Guatemala:	108,890 sq km
Cuba:	110,860 sq km
Bulgaria:	110,910 sq km
Liberia:	111,370 sq km
Honduras:	112,090 sq km
Benin:	112,620 sq km
Malawi:	118,480 sq km
Korea, North:	120,540 sq km
Eritrea:	121,320 sq km
Nicaragua:	129,494 sq km
Greece:	131,940 sq km
Nepal:	140,800 sq km
Tajikistan:	143,100 sq km
Bangladesh:	144,000 sq km
Suriname:	163,270 sq km
Tunisia:	163,610 sq km
Uruguay:	176,220 sq km
Cambodia:	181,040 sq km
Syria:	185,180 sq km
Senegal:	196,190 sq km
Kyrgyzstan:	198,500 sq km
Belarus:	207,600 sq km
Oman:	212,460 sq km
Guyana:	214,970 sq km
Uganda:	236,040 sq km
Laos:	236,800 sq km
Romania:	237,500 sq km
Ghana:	239,460 sq km
United Kingdom:	244,820 sq km
Guinea:	245,857 sq km
Western Sahara:	266,000 sq km
Gabon:	267,667 sq km
New Zealand:	268,680 sq km
Burkina Faso:	274,200 sq km
Ecuador:	283,560 sq km
Philippines:	300,000 sq km
Italy:	301,230 sq km
Poland:	312,685 sq km
Cote d'Ivoire:	322,460 sq km
Norway:	324,220 sq km
Vietnam:	329,560 sq km
Malaysia:	329,750 sq km



FEATURE: Natural hazards

Files Data File Edit

Bahamas, The: hurricanes and other tropical storms cause extensive f
 Guadeloupe: hurricanes (June to October); Soufriere de Guadeloupe is
 Tonga: cyclones (October to April); earthquakes and volcanic activit
 Grenada: lies on edge of hurricane belt; hurricane season lasts from
 Israel: sandstorms may occur during spring and summer; droughts; per
 Ghana: dry, dusty, northeastern harmattan winds occur from January t
 Ecuador: frequent earthquakes, landslides, volcanic activity; floods
 Northern Mariana Islands: active volcanoes on Pagan and Agrihan; typ
 Albania: destructive earthquakes; tsunamis occur along southwestern
 Saint Vincent and the Grenadines: hurricanes; Soufriere volcano on t
 Chad: hot, dry, dusty harmattan winds occur in north; periodic droug
 Seychelles: lies outside the cyclone belt, so severe storms are rare
 Mozambique: severe droughts; devastating cyclones and floods in cent
 Indonesia: occasional floods, severe droughts, tsunamis, earthquakes
 Colombia: highlands subject to volcanic eruptions; occasional earthq
 Guinea-Bissau: hot, dry, dusty harmattan haze may reduce visibility
 Nicaragua: destructive earthquakes, volcanoes, landslides; extremely
 Algeria: mountainous areas subject to severe earthquakes; mudslides
 Morocco: northern mountains geologically unstable and subject to ear
 Togo: hot, dry harmattan wind can reduce visibility in north during
 Jan Mayen: dominated by the volcano Haakon VII Toppen/Beerenberg; vo
 Oman: summer winds often raise large sandstorms and dust storas in i
 Thailand: land subsidence in Bangkok area resulting from the depleti
 Bangladesh: droughts, cyclones; much of the country routinely inunda
 Mauritania: hot, dry, dust/sand-laden sirocco wind blows primarily i
 Mongolia: dust storms, grassland and forest fires, drought, and "zud
 Belize: frequent, devastating hurricanes (June to November) and coas
 Vanuatu: tropical cyclones or typhoons (January to April); volcanism
 Korea, South: occasional typhoons bring high winds and floods; low-l
 France: flooding; avalanches; midwinter windstorms; drought; forest
 Korea, North: late spring droughts often followed by severe flooding
 Mauritius: cyclones (November to April); almost completely surrounde
 Somalia: recurring droughts; frequent dust storms over eastern plain
 Vietnam: occasional typhoons (May to January) with extensive floodin
 Romania: earthquakes, most severe in south and southwest; geologic s
 Virgin Islands: several hurricanes in recent years; frequent and sev
 Cote d'Ivoire: coast has heavy surf and no natural harbors; during t
 Cameroon: volcanic activity with periodic releases of poisonous gas
 Sierra Leone: dry, sand-laden harmattan winds blow from the Sahara (
 Kingman Reef: vet or avash most of the time, maximum elevation of ab
 Martinique: hurricanes, flooding, and volcanic activity (an average
 Ethiopia: geologically active Great Rift Valley susceptible to earth
 Dominica: flash floods are a constant threat; destructive hurricanes
 Cape Verde: prolonged droughts; seasonal harmattan wind produces obs
 Comoros: cyclones possible during rainy season (December to April);
 Solomon Islands: typhoons, but rarely destructive; geologically acti
 Sweden: ice floes in the surrounding waters, especially in the Gulf

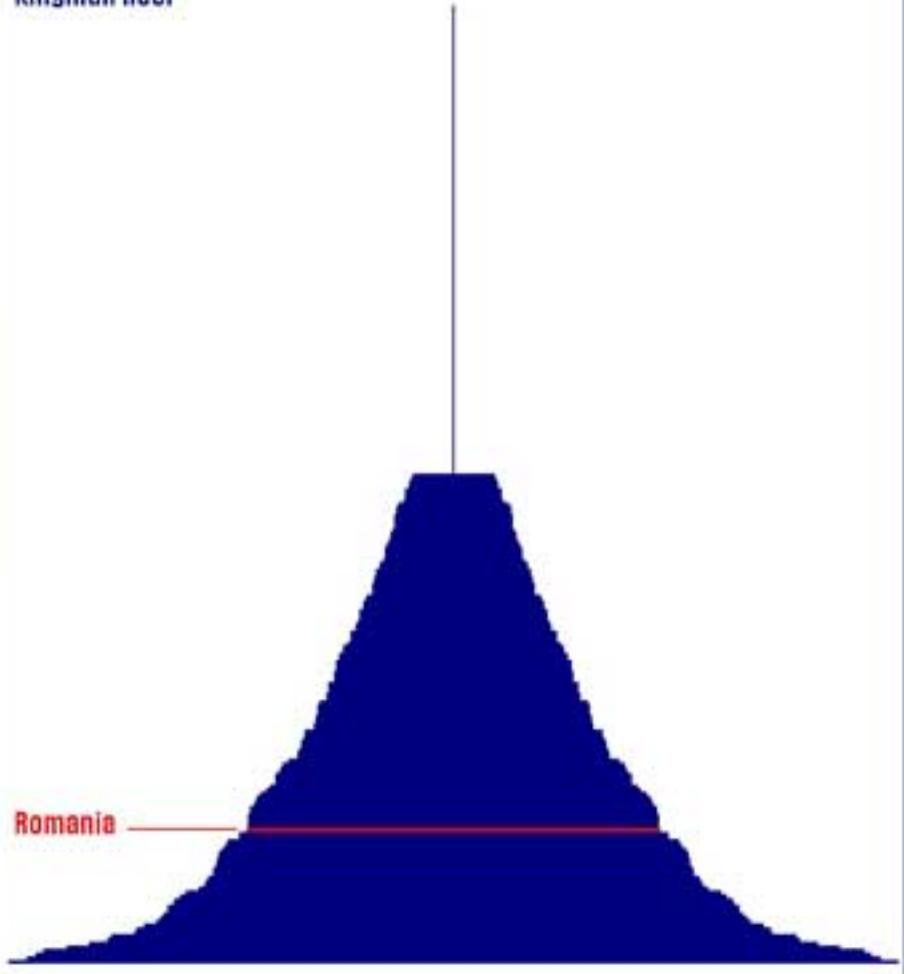


Files Data File Edit

Kyrgyzstan: limited illicit cultivation of cannabis and opium poppy
 Honduras: transshipment point for drugs and narcotics; illicit produ
 Cape Verde: used as a transshipment point for illicit drugs moving f
 Haiti: major Caribbean transshipment point for cocaine en route to t
 Germany: source of precursor chemicals for South American cocaine pr
 Portugal: gateway country for Latin American cocaine and Southwest A
 Azerbaijan: limited illicit cultivation of cannabis and opium poppy,
 Armenia: illicit cultivation of small amount of cannabis for domesti
 Benin: transshipment point for narcotics associated with Nigerian tr
 Egypt: transit point for Southwest Asian and Southeast Asian heroin
 Bosnia and Herzegovina: minor transit point for marijuana and opiate
 Netherlands: major European producer of ecstasy, illicit amphetamine
 Tanzania: growing role in transshipment of southwest and southeast A
 Lebanon: cannabis cultivation dramatically reduced to 2,500 hectares
 United Arab Emirates: the UAE is a drug transshipment point for traf
 Moldova: limited cultivation of opium poppy and cannabis, mostly for
 Bulgaria: major European transshipment point for Southwest Asian her
 Czech Republic: transshipment point for Southwest Asian heroin and m
 Lithuania: transshipment point for opiates and other illicit drugs f
 Congo, Democratic Republic of the: illicit producer of cannabis, mos
 Kazakhstan: significant illicit cultivation of cannabis for CIS mark
 Greece: a gateway to Europe for traffickers smuggling cannabis and h
 Paraguay: major illicit producer of cannabis, most or all of which i
 Spain: key European gateway country and consumer for Latin American
 Hong Kong: makes strenuous law enforcement efforts, but faces diffic
 Cambodia: narcotics-related corruption reportedly involving some in
 Zambia: transshipment point for moderate amounts of methaqualone, sm
 Hungary: transshipment point for Southwest Asian heroin and cannabis
 Dominican Republic: transshipment point for South American drugs des
 Iran: despite substantial interdiction efforts, Iran remains a key t
 Panama: major cocaine transshipment point and primary money-launders
 United States: consumer of cocaine shipped from Colombia through Mex
 Tajikistan: major transit country for Afghan narcotics bound for Rus
 India: world's largest producer of licit opium for the pharmaceutical
 Jamaica: major transshipment point for cocaine from South America to
 Mauritius: minor consumer and transshipment point for heroin from So
 Canada: illicit producer of cannabis for the domestic drug market an
 Romania: major transshipment point for Southwest Asian heroin transi
 Uzbekistan: transit country for Afghan narcotics bound for Russian a
 Liberia: transshipment point for Southeast and Southwest Asian heroi
 Macedonia: major transshipment point for Southwest Asian heroin and
 Belarus: limited cultivation of opium poppy and cannabis, mostly for
 Ghana: illicit producer of cannabis for the international drug trade
 Belgium: growing producer of synthetic drugs; transit point for US-b
 Kenya: widespread harvesting of small plots of marijuana; transit co
 Chile: important transshipment country for cocaine destined for Euro
 Switzerland: a major international financial center vulnerable to th

ILLICIT DRUGS

Kingman Reef



Colombia

Files Data File Edit

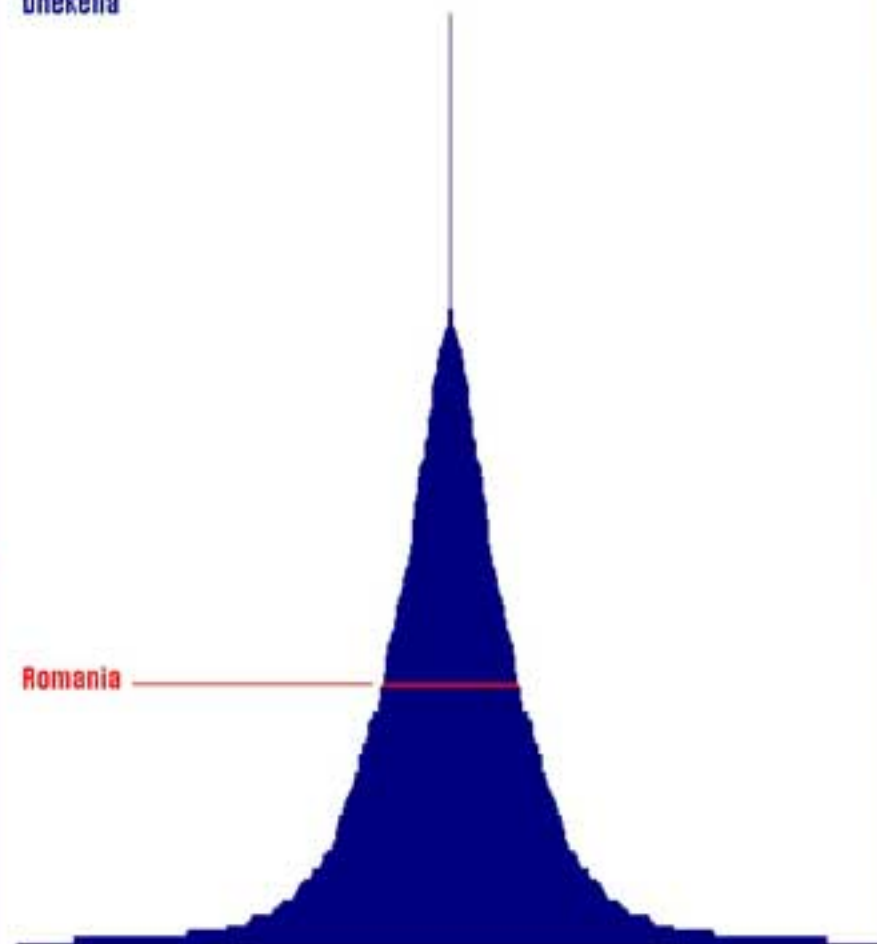
Gaza Strip: West Bank and Gaza Strip are Israeli-occupied with current
 Lebanon: intense international pressure prompts the removal of Syria
 Korea, South: Military Demarcation Line within the 4-km wide Demilitarized
 Czech Republic: in February 2005, the ICJ refused to rule on the res
 Congo, Republic of the: about 7,000 Congolese refugees fleeing inter
 Gabon: UN presses Equatorial Guinea and Gabon to resolve the soverei
 Norway: Norway asserts a territorial claim in Antarctica (Queen Maud
 Mexico: prolonged drought, population growth, and outdated practices
 Uganda: Uganda is subject to armed fighting among hostile ethnic gro
 Djibouti: Djibouti maintains economic ties and border accords with
 Burkina Faso: two villages are in dispute along the border with Beni
 Turkey: complex maritime, air, and territorial disputes with Greece
 Faroe Islands: because anticipated offshore hydrocarbon resources ha
 Turkmenistan: cotton monoculture in Uzbekistan and Turkmenistan crea
 Peru: Peru proposes changing its latitudinal maritime boundary with
 Western Sahara: Morocco claims and administers Western Sahara, whose
 Haiti: since 2004, about 8,000 peacekeepers from the UN Stabilizatio
 Belize: Guatemalan squatters continue to settle in the largely unin
 Denmark: Iceland disputes the Faroe Islands' fisheries median line;
 Zambia: in 2004 Zimbabwe dropped objections and joined Namibia in su
 France: Madagascar claims Bassas da India, Europa Island, Gloriosos I
 Chad: since 2003, Janjawid armed militia and Sudanese military have
 Tajikistan: boundary agreements signed in 2002 cede 1,000 sq km of P
 Canada: managed maritime boundary disputes with the US at Dixon Entr
 Niger: Libya claims about 25,000 sq km in a currently dormant disput
 Uzbekistan: cotton monoculture in Uzbekistan and Turkmenistan create
 Cote d'Ivoire: rebel and ethnic fighting against the central governa
 Kenya: Kenya served as an important mediator in brokering Sudan's no
 Yemen: Yemen protests Eritrea fishing around the Hanish Islands awar
 Suriname: area claimed by French Guiana between Riviere Litani and R
 Albania: the Albanian Government calls for the protection of the rig
 Guatemala: Guatemalan squatters continue to settle in the rain fores
 Romania: Romania and Ukraine have taken their dispute over Ukrainian
 Kazakhstan: in 2005, Kazakhstan agreed with Russia, Turkmenistan, an
 Slovakia: Hungary amended its status law extending special social an
 Brazil: unruly region at convergence of Argentina-Brazil-Paraguay bo
 Zimbabwe: Botswana has built electric fences and South Africa has pl
 Sierra Leone: domestic fighting among disparate rebel groups, warlor
 Slovenia: the Croatia-Slovenia land and maritime boundary agreement,
 Chile: Chile rebuffs Bolivia's reactivated claim to restore the Atac
 Singapore: disputes persist with Malaysia over deliveries of fresh w
 Syria: Golan Heights is Israeli-occupied with the almost 1,000-stro
 El Salvador: in 1992, the ICJ ruled on the delimitation of "bolsones
 Saudi Arabia: despite resistance from nomadic groups, the demarcatio
 Iran: Iran protests Afghanistan's limiting flow of dammed tributarie
 United Arab Emirates: because the treaties have not been made public
 Laos: Southeast Asian states have enhanced border surveillance to ch

DISPUTES - INTERNATIONAL

Dhekelia

Romania

Russia



Bulgaria: 630,000 (2002)
 Tunisia: 630,000 (2003)
 Lithuania: 695,700 (2003)
 Slovenia: 750,000 (2002)
 Nigeria: 750,000 (2003)
 Morocco: 800,000 (2003)
 Costa Rica: 800,000 (2002)
 Serbia and Montenegro: 847,000 (2003)
 Latvia: 936,000 (2002)
 Croatia: 1.014 million (2003)
 United Arab Emirates: 1,110,200 (2003)
 Ireland: 1.26 million (2003)
 Venezuela: 1,274,400 (2002)
 Slovakia: 1,375,800 (2003)
 Belarus: 1,391,900 (2003)
 Saudi Arabia: 1.5 million (2003)
 Pakistan: 1.5 million (2002)
 Hungary: 1.6 million (2002)
 Greece: 1,718,400 (2003)
 Israel: 2 million (2002)
 New Zealand: 2.11 million (2003)
 Norway: 2.288 million (2002)
 Singapore: 2.31 million (2002)
 Switzerland: 2.556 million (2002)
 Finland: 2.65 million (2002)
 Czech Republic: 2.7 million (2003)
 Egypt: 2.7 million (2003)
 Colombia: 2,732,200 (2003)
 Denmark: 2.756 million (2002)
 Peru: 2.85 million (2003)
 South Africa: 3.1 million (2002)
 Hong Kong: 3,212,800 (2003)
 Belgium: 3.4 million (2002)
 Philippines: 3.5 million (2002)
 Vietnam: 3.5 million (2003)
 Chile: 3.575 million (2002)
 Portugal: 3.6 million (2002)
 Austria: 3.73 million (2003)
 Ukraine: 3.8 million (2003)
Romania: 4 million (2003)
 Argentina: 4.1 million (2002)
 Iran: 4.3 million (2003)
 Sweden: 5.125 million (2002)
 Turkey: 5.5 million (2003)
 Russia: 6 million (2002)
 Thailand: 6,971,500 (2003)
 Indonesia: 8 million (2002)

INTERNET USERS

Kingman Reef

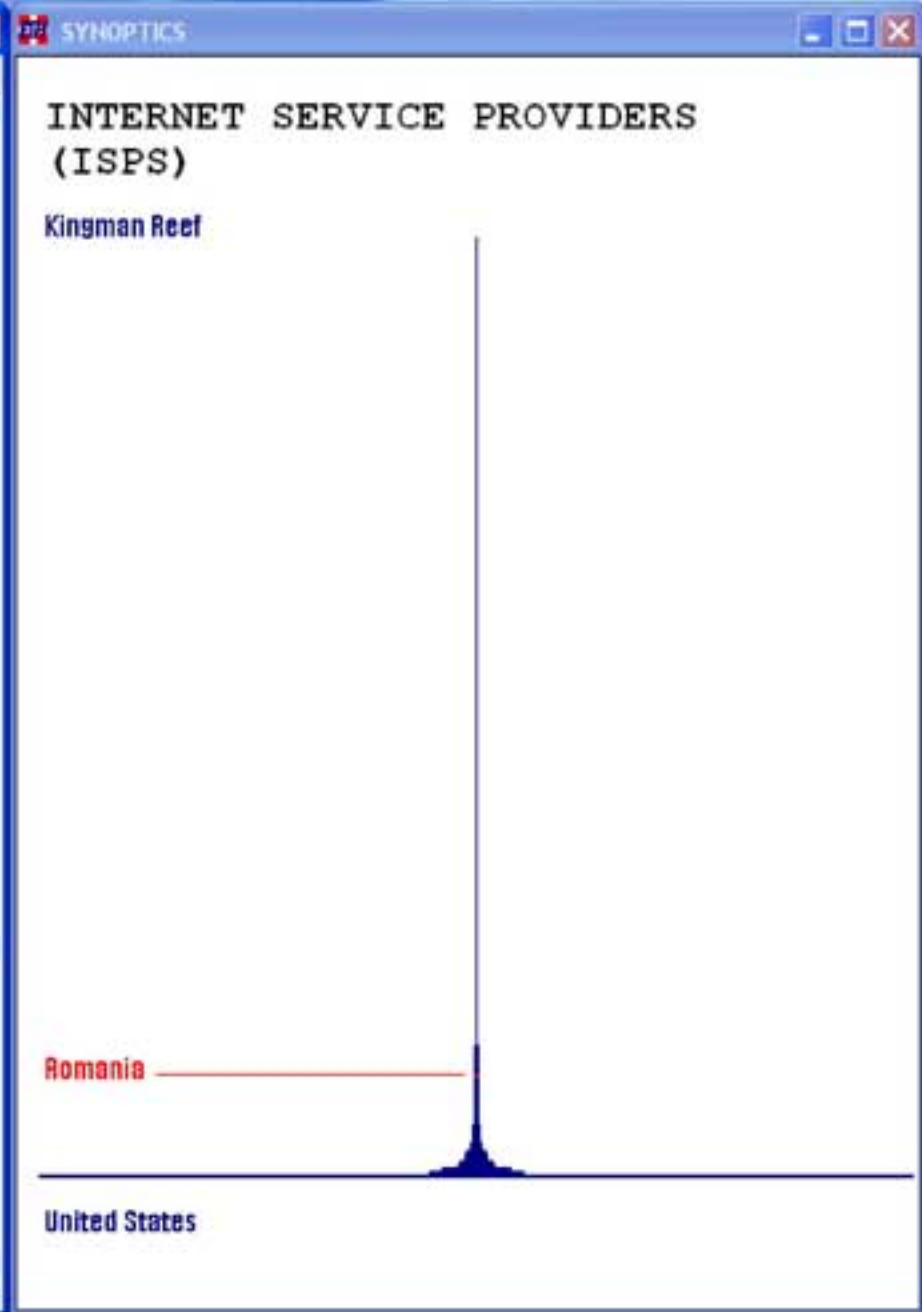
Romania

United States

FEATURE: Internet Service Providers (ISPs)

Files Data File Edit

- Saint Lucia: 15 (2000)
- Thailand: 15 (2000)
- Dominica: 16 (2000)
- British Virgin Islands: 16 (2000)
- Saint Kitts and Nevis: 16 (2000)
- Portugal: 16 (2000)
- Venezuela: 16 (2000)
- Antigua and Barbuda: 16 (2000)
- Hungary: 16 (2000)
- Cayman Islands: 16 (2000)
- Anguilla: 16 (2000)
- Montserrat: 17 (2000)
- Hong Kong: 17 (2000)
- Trinidad and Tobago: 17 (2000)
- Colombia: 18 (2000)
- Bahamas, The: 19 (2000)
- Barbados: 19 (2000)
- Poland: 19 (2000)
- Bermuda: 20 (2000)
- Guam: 20 (2000)
- Iceland: 20 (2001)
- Jamaica: 21 (2000)
- Israel: 21 (2000)
- Saudi Arabia: 22 (2000)
- Lebanon: 22 (2000)
- Ireland: 22 (2000)
- Belarus: 23 (2002)
- Indonesia: 24 (2000)
- Dominican Republic: 24 (2000)
- Greece: 27 (2000)
- Sweden: 29 (2000)
- Pakistan: 30 (2000)
- Ecuador: 31 (2001)
- Lithuania: 32 (2001)
- Philippines: 33 (2000)
- Argentina: 33 (2000)
- New Zealand: 36 (2000)
- Austria: 37 (2000)
- Romania: 38 (2000)**
- Estonia: 38 (2001)
- Latvia: 41 (2001)
- Uzbekistan: 42 (2000)
- India: 43 (2000)
- Switzerland: 44 (Switzerland and Liechtenstein) (2000)
- Liechtenstein: 44 (Liechtenstein and Switzerland) (2000)
- Egypt: 50 (2000)
- Virgin Islands: 50 (2000)



Files Data File Edit

Ghana: \$7.396 billion (2004 est.)
 Dominican Republic: \$7.745 billion (2004 est.)
 Afghanistan: \$8 billion in bilateral debt, mostly to Russia; Afghani
 Estonia: \$8.373 billion (2004 est.)
 Cameroon: \$8.46 billion (2004 est.)
 Panama: \$8.78 billion (2004 est.)
 Lithuania: \$10.01 billion (2004 est.)
 Angola: \$10.45 billion (2004 est.)
 Sri Lanka: \$10.85 billion (2004 est.)
 Ireland: \$11 billion (1998)
 Congo, Democratic Republic of the: \$11.6 billion (2000 est.)
 Cote d'Ivoire: \$11.81 billion (2004 est.)
 Korea, North: \$12 billion (1996 est.)
 Cuba: \$12.09 billion (convertible currency); another \$15-20 billion
 Uruguay: \$12.8 billion (March 2004)
 Serbia and Montenegro: \$12.97 billion (2004 est.)
 Iran: \$13.4 billion (2004 est.)
 Slovenia: \$14.65 billion (2004 est.)
 Tunisia: \$14.71 billion (2004 est.)
 Kuwait: \$15.02 billion (2004 est.)
 Austria: \$15.5 billion (2003 est.)
 Lebanon: \$15.84 billion (2004 est.)
 Bulgaria: \$16.1 billion (November 2004 est.)
 Ukraine: \$16.37 billion (2004 est.)
 Vietnam: \$16.55 billion (2004 est.)
 Ecuador: \$16.81 billion (2004 est.)
 Turkey: \$16.9 billion (2004 est.)
 Morocco: \$17.07 billion (2004 est.)
 Monaco: \$18 billion (2000 est.)
 Qatar: \$18.62 billion (2004 est.)
 Singapore: \$19.4 billion (2004 est.)
 Slovakia: \$19.54 billion (2004 est.)
 Bangladesh: \$19.97 billion (2004 est.)
 Sudan: \$21 billion (2004 est.)
 Denmark: \$21.7 billion (2000)
 Algeria: \$21.9 billion (2004 est.)
 Romania: \$24.59 billion (2004 est.)
 Kazakhstan: \$26.03 billion (2004 est.)
 Croatia: \$26.4 billion (2004 est.)
 South Africa: \$27.01 billion (2004 est.)
 Belgium: \$28.3 billion (1999 est.)
 Peru: \$29.79 billion (2004 est.)
 Finland: \$30 billion (December 1993)
 Nigeria: \$30.55 billion (2004 est.)
 Venezuela: \$33.29 billion (2004 est.)
 Egypt: \$33.75 billion (2004 est.)
 Pakistan: \$33.97 billion (2004 est.)

DEBT - EXTERNAL

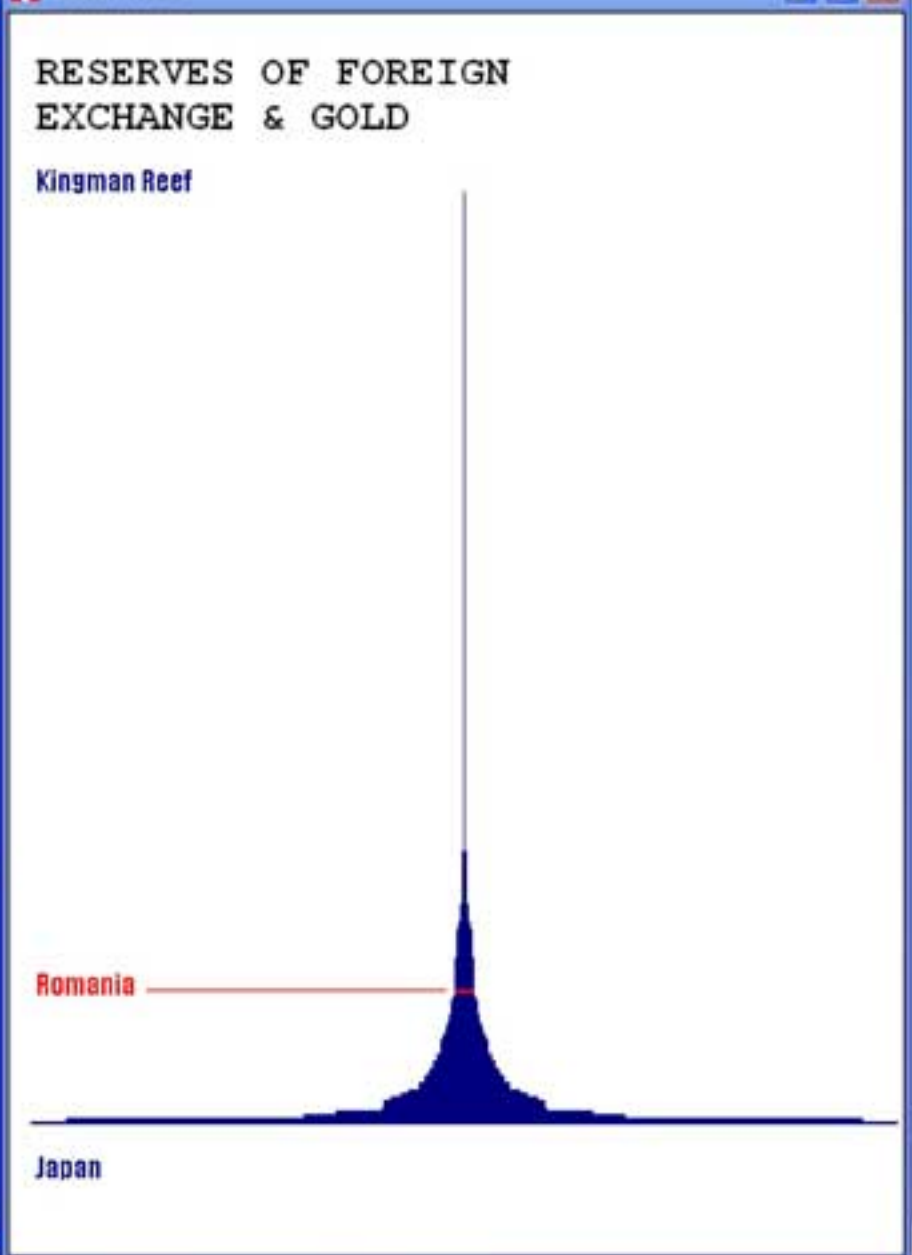
Kingman Reef

Romania

United Kingdom

Files Data File Edit

Bangladesh:	\$3 billion (2004 est.)
Turkmenistan:	\$3.034 billion (2004 est.)
Guatemala:	\$3.084 billion (2004 est.)
Qatar:	\$3.351 billion (2004 est.)
Tunisia:	\$3.509 billion (2004 est.)
Serbia and Montenegro:	\$3.55 billion (2004 est.)
Oman:	\$4.144 billion (2004 est.)
Ireland:	\$4.152 billion (2003)
Lithuania:	\$4.61 billion (2004 est.)
New Zealand:	\$4.805 billion (2004 est.)
Syria:	\$5 billion (2004 est.)
Yemen:	\$5.3 billion (2004 est.)
Jordan:	\$5.457 billion (2004 est.)
Botswana:	\$5.7 billion (2004 est.)
Vietnam:	\$6.51 billion (2004 est.)
Greece:	\$7.3 billion (2004 est.)
Kuwait:	\$7.333 billion (2004 est.)
Bulgaria:	\$7.526 billion (2004 est.)
Slovenia:	\$8.493 billion (2004 est.)
Croatia:	\$8.563 billion (2004 est.)
Finland:	\$11.17 billion (2003)
Ukraine:	\$11.33 billion (2004 est.)
South Africa:	\$11.68 billion (2004 est.)
Colombia:	\$11.94 billion (2004 est.)
Portugal:	\$12.3 billion (2004 est.)
Pakistan:	\$12.58 billion (2004 est.)
Peru:	\$12.7 billion (2004 est.)
Austria:	\$12.73 billion (2003)
Egypt:	\$14.03 billion (2004 est.)
Kazakhstan:	\$14.35 billion (2004 est.)
Belgium:	\$14.45 billion (2003)
Nigeria:	\$14.71 billion (2004 est.)
Hungary:	\$14.8 billion (2004 est.)
Slovakia:	\$14.91 billion (2004 est.)
Morocco:	\$15.14 billion (2004 est.)
Chile:	\$16.02 billion (2004)
Philippines:	\$16.05 billion (2004)
Romania:	\$16.21 billion (2004)
Lebanon:	\$16.3 billion (2004 est.)
United Arab Emirates:	\$18.64 billion (2004 est.)
Argentina:	\$19.47 billion (2004 est.)
Spain:	\$19.7 billion (2004 est.)
Sveden:	\$19.99 billion (2003)
Netherlands:	\$21.44 billion (2003)
Saudi Arabia:	\$23.62 billion (2004 est.)
Libya:	\$24.18 billion (2004 est.)
Venezuela:	\$25.75 billion (2004 est.)

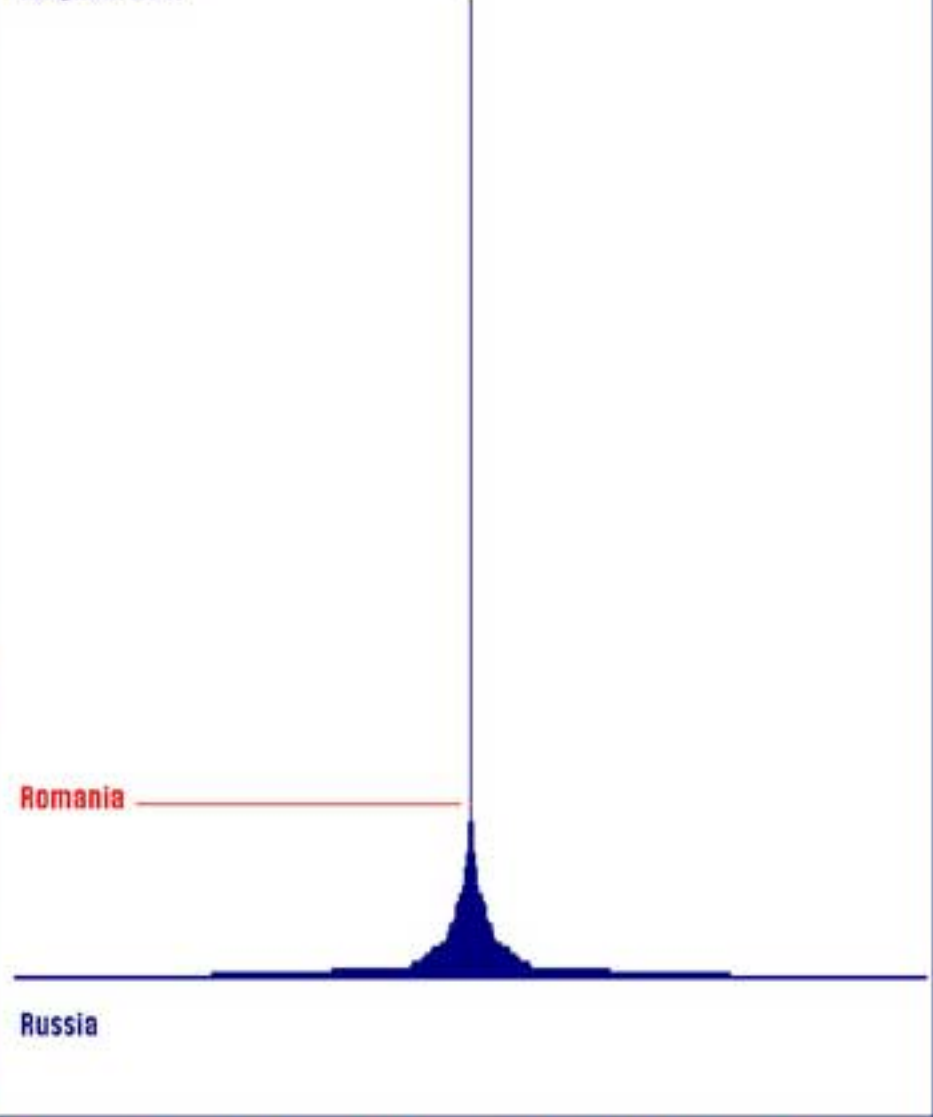


Files Data File Edit

Slovakia:	7.504 billion cu m	(1 January 2002)
Turkey:	8.685 billion cu m	(1 January 2002)
Ireland:	9.911 billion cu m	(1 January 2002)
Tanzania:	11.33 billion cu m	(1 January 2002)
Ghana:	11.89 billion cu m	(1 January 2002)
Ethiopia:	12.46 billion cu m	(1 January 2002)
France:	12.86 billion cu m	(1 January 2002)
South Africa:	14.16 billion cu m	(1 January 2002)
Cote d'Ivoire:	14.87 billion cu m	(2004)
Japan:	20.02 billion cu m	(1 January 2002)
Israel:	20.81 billion cu m	(1 January 2002)
Serbia and Montenegro:	24.07 billion cu m	(1 January 2002)
Austria:	24.9 billion cu m	(1 January 2002)
Rwanda:	28.32 billion cu m	(1 January 2002)
Namibia:	31.15 billion cu m	(1 January 2002)
Croatia:	34.36 billion cu m	(1 January 2002)
Taiwan:	38.23 billion cu m	(2004)
Cuba:	42.62 billion cu m	(1 January 2002)
Bahrain:	46 billion cu m	(2004)
Afghanistan:	49.98 billion cu m	(1 January 2002)
Hungary:	50.45 billion cu m	(1 January 2002)
Cameroon:	55.22 billion cu m	(2004)
New Zealand:	58.94 billion cu m	(1 January 2002)
Azerbaijan:	62.3 billion cu m	(1 January 2002)
Mozambique:	63.71 billion cu m	(1 January 2002)
Gabon:	66.47 billion cu m	(2004)
Equatorial Guinea:	68.53 billion cu m	(1 January 2002)
Tunisia:	77.16 billion cu m	(2004)
Angola:	79.57 billion cu m	(2004)
Denmark:	81.98 billion cu m	(1 January 2002)
Chile:	99.05 billion cu m	(1 January 2004)
Sudan:	99.11 billion cu m	(2004)
Congo, Democratic Republic of the:	104.8 billion cu m	(1 January 2004)
Ecuador:	106.5 billion cu m	(2004)
Philippines:	107.6 billion cu m	(1 January 2004)
Romania:	111.1 billion cu m	(1 January 2002)
Colombia:	132 billion cu m	(2004)
Bangladesh:	150.3 billion cu m	(1 January 2002)
Poland:	154.4 billion cu m	(1 January 2002)
Vietnam:	192.6 billion cu m	(2004)
Italy:	209.7 billion cu m	(1 January 2002)
Brazil:	221.7 billion cu m	(2004)
Syria:	240.7 billion cu m	(2004)
Peru:	245.1 billion cu m	(2004)
Germany:	293 billion cu m	(1 January 2004)
Brunei:	315 billion cu m	(1 January 2002)
Thailand:	368.2 billion cu m	(1 January 2003)

NATURAL GAS - PROVED RESERVES

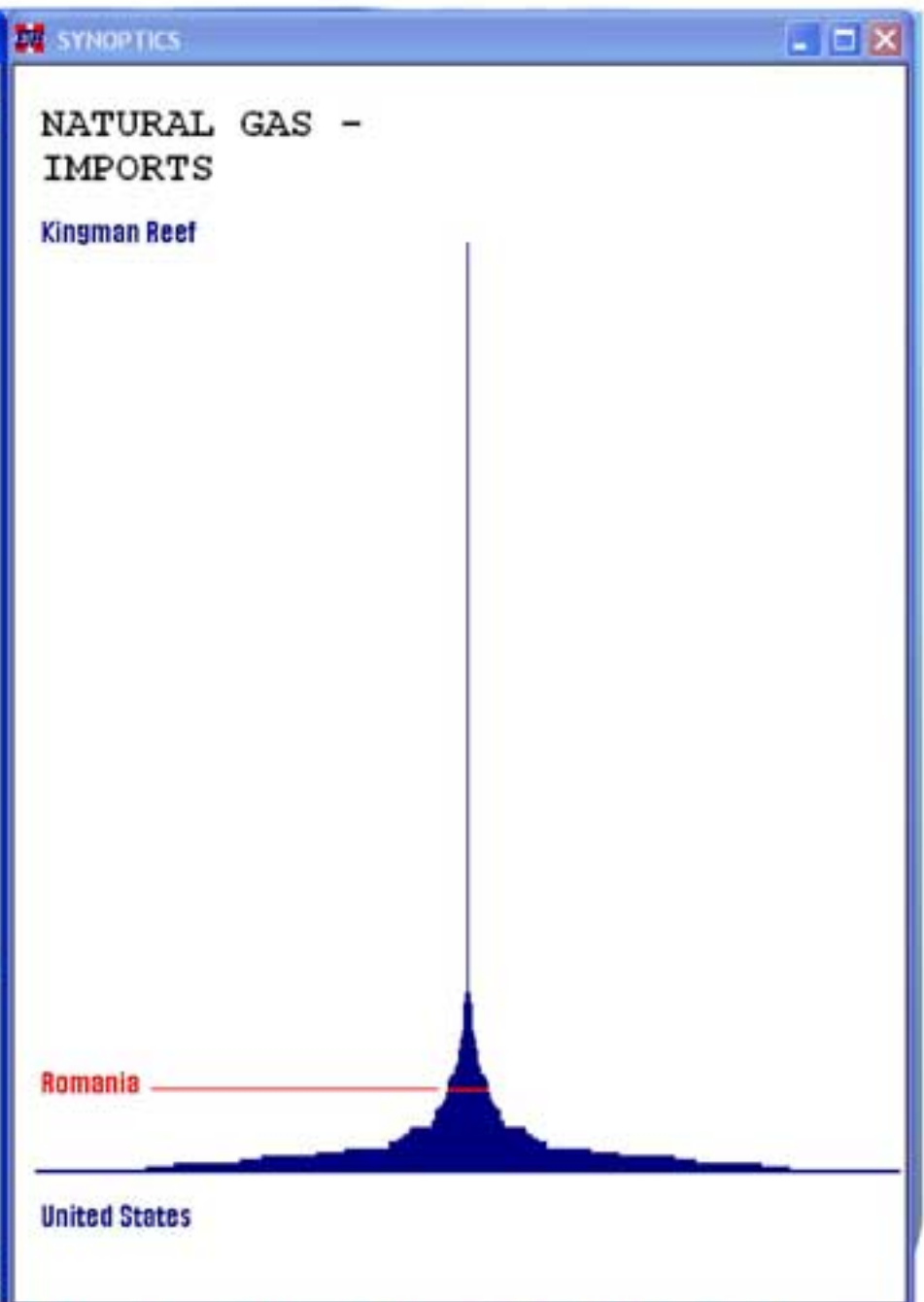
Kingman Reef



FEATURE: Natural gas - imports

Files Data File Edit

Jarvis Island: NA
 West Bank: NA
 Heard Island and McDonald Islands: NA
 Wallis and Futuna: NA
 Cayman Islands: NA
 Western Sahara: NA
 United Arab Emirates: 0 cu m (2003 est.)
 Wake Island: NA
 French Southern and Antarctic Lands: NA
 Samoa: NA
 Uruguay: 65 million cu m (2003 est.)
 Bosnia and Herzegovina: 300 million cu m (2001 est.)
 Puerto Rico: 630 million cu m (2001 est.)
 Hong Kong: 600.9 million cu m (2001 est.)
 Luxembourg: 867 million cu m (2001 est.)
 Sweden: 968 million cu m (2001 est.)
 Azerbaijan: 1 billion cu m (2001 est.)
 Slovenia: 1.04 billion cu m (2001 est.)
 Croatia: 1.08 billion cu m (2001 est.)
 Georgia: 1.1 billion cu m (2001 est.)
 Tajikistan: 1.25 billion cu m (2001 est.)
 Estonia: 1.27 billion cu m (2001 est.)
 Armenia: 1.4 billion cu m (2001 est.)
 Tunisia: 1.58 billion cu m (2001 est.)
 Latvia: 1.7 billion cu m (2001 est.)
 Kyrgyzstan: 2 billion cu m (2001 est.)
 Greece: 2.018 billion cu m (2001 est.)
 Moldova: 2.05 billion cu m (2001 est.)
 Singapore: 2.5 billion cu m
 Portugal: 2.553 billion cu m (2001 est.)
 United Kingdom: 2.7 billion cu m (2001 est.)
 Lithuania: 2.76 billion cu m (2001 est.)
 Switzerland: 3.093 billion cu m (2001 est.)
 Ireland: 3.384 billion cu m (2001 est.)
 Brazil: 3.64 billion cu m (2001 est.)
 Finland: 4.567 billion cu m (2001 est.)
 Iran: 4.92 billion cu m (2003 est.)
 Thailand: 5.2 billion cu m (2001 est.)
 Chile: 5.337 billion cu m (2002 est.)
 Romania: 5.4 billion cu m (2001 est.)
 Bulgaria: 5.8 billion cu m (2001 est.)
 Austria: 6.033 billion cu m (2001 est.)
 Taiwan: 6.3 billion cu m (2001 est.)
 Slovakia: 6.6 billion cu m (2003 est.)
 Mexico: 7.85 billion cu m (2004 est.)
 Kazakhstan: 8.696 billion cu m (2003 est.)
 Canada: 8.73 billion cu m (2003 est.)



Files Data File Edit

Greece: 2.021 billion cu m (2001 est.)
 Moldova: 2.05 billion cu m (2001 est.)
 Iraq: 2.35 billion cu m (2002 est.)
 Singapore: 2.5 billion cu m (2001 est.)
 Portugal: 2.542 billion cu m (2001 est.)
 Lithuania: 2.75 billion cu m (2001 est.)
 Croatia: 2.84 billion cu m (2001 est.)
 Switzerland: 3.093 billion cu m (2001 est.)
 Tunisia: 3.83 billion cu m (2001 est.)
 Norway: 4.1 billion cu m (2001 est.)
 Ireland: 4.199 billion cu m (2001 est.)
 Finland: 4.557 billion cu m (2001 est.)
 Denmark: 5.28 billion cu m (2001 est.)
 Libya: 5.41 billion cu m (2001 est.)
 Colombia: 5.7 billion cu m (2001 est.)
 Bulgaria: 5.804 billion cu m (2001 est.)
 Syria: 5.84 billion cu m (2001 est.)
 Oman: 6.34 billion cu m (2001 est.)
 New Zealand: 6.504 billion cu m (2001 est.)
 Chile: 6.517 billion cu m (2002 est.)
 Taiwan: 6.64 billion cu m (2001 est.)
 Azerbaijan: 6.72 billion cu m (2001 est.)
 Slovakia: 6.8 billion cu m (2003 est.)
 Austria: 7.81 billion cu m (2001 est.)
 Nigeria: 7.85 billion cu m (2001 est.)
 Kuwait: 8.7 billion cu m (2002 est.)
 Brazil: 9.59 billion cu m (2001 est.)
 Turkmenistan: 9.6 billion cu m (2001 est.)
 Czech Republic: 9.892 billion cu m (2001 est.)
 Bangladesh: 9.9 billion cu m (2001 est.)
 Hungary: 13.97 billion cu m (2001 est.)
 Trinidad and Tobago: 13.76 billion cu m (2003 est.)
 Poland: 13.85 billion cu m (2001 est.)
 Kazakhstan: 14.3 billion cu m (2001 est.)
 Belgium: 15.5 billion cu m (2001 est.)
 Qatar: 15.86 billion cu m (2001 est.)
 Turkey: 15.94 billion cu m (2001 est.)
 Spain: 17.96 billion cu m (2001 est.)
Romania: 18.5 billion cu m (2003 est.)
 Belarus: 18.8 billion cu m (2004 est.)
 Korea, South: 20.92 billion cu m (2003 est.)
 Egypt: 21.2 billion cu m (2001 est.)
 Algeria: 22.32 billion cu m (2001 est.)
 India: 22.75 billion cu m (2001 est.)
 Australia: 23.33 billion cu m (2001 est.)
 Pakistan: 23.4 billion cu m (2001 est.)
 Thailand: 23.93 billion cu m (2001 est.)

NATURAL GAS - CONSUMPTION

Kingman Reef

Romania

United States

Files Data File Edit

Ecuador: 160 million cu m (2001 est.)
 Slovakia: 190 million cu m (2003 est.)
 Afghanistan: 220 million cu m (2001 est.)
 Belarus: 250 million cu m (2004 est.)
 Jordan: 290 million cu m (2001 est.)
 Turkey: 312 million cu m (2001 est.)
 Spain: 516 million cu m (2001 est.)
 Angola: 530 million cu m (2001 est.)
 Cuba: 600 million cu m (2001 est.)
 Serbia and Montenegro: 602 million cu m (2001 est.)
 Taiwan: 750 million cu m (2001 est.)
 Ireland: 815 million cu m (2001 est.)
 Peru: 910 million cu m (2004 est.)
 Chile: 1.18 billion cu m (2002 est.)
 Vietnam: 1.3 billion cu m (2001 est.)
 Cote d'Ivoire: 1.35 billion cu m (2001 est.)
 Austria: 1.731 billion cu m (2001 est.)
 Croatia: 1.76 billion cu m (2001 est.)
 South Africa: 1.8 billion cu m (2001 est.)
 France: 1.898 billion cu m (2001 est.)
 Tunisia: 2.25 billion cu m (2001 est.)
 Iraq: 2.35 billion cu m (2002 est.)
 Japan: 2.519 billion cu m (2001 est.)
 Hungary: 3.231 billion cu m (2001 est.)
 Poland: 5.471 billion cu m (2001 est.)
 Colombia: 5.7 billion cu m (2001 est.)
 Azerbaijan: 5.72 billion cu m (2001 est.)
 Syria: 5.84 billion cu m (2001 est.)
 Brazil: 5.95 billion cu m (2001 est.)
 Libya: 6.18 billion cu m (2001 est.)
 New Zealand: 6.504 billion cu m (2001 est.)
 Denmark: 8.38 billion cu m (2001 est.)
 Bolivia: 8.44 billion cu m (2004 est.)
 Kuwait: 8.7 billion cu m (2002 est.)
 Bangladesh: 9.9 billion cu m (2001 est.)
 Burma: 9.98 billion cu m (2003 est.)
 Brunei: 10.35 billion cu m (2001 est.)
 Kazakhstan: 11.6 billion cu m (2004 est.)
 Romania: 12.6 billion cu m (2003 est.)
 Oman: 13.77 billion cu m (2001 est.)
 Italy: 15.49 billion cu m (2001 est.)
 Nigeria: 15.68 billion cu m (2001 est.)
 Thailand: 18.73 billion cu m (2001 est.)
 Ukraine: 19.6 billion cu m (2003 est.)
 Germany: 21 billion cu m (2003)
 Egypt: 21.2 billion cu m (2001 est.)
 India: 22.75 billion cu m (2001 est.)

NATURAL GAS - PRODUCTION

Kingman Reef

Romania

Russia

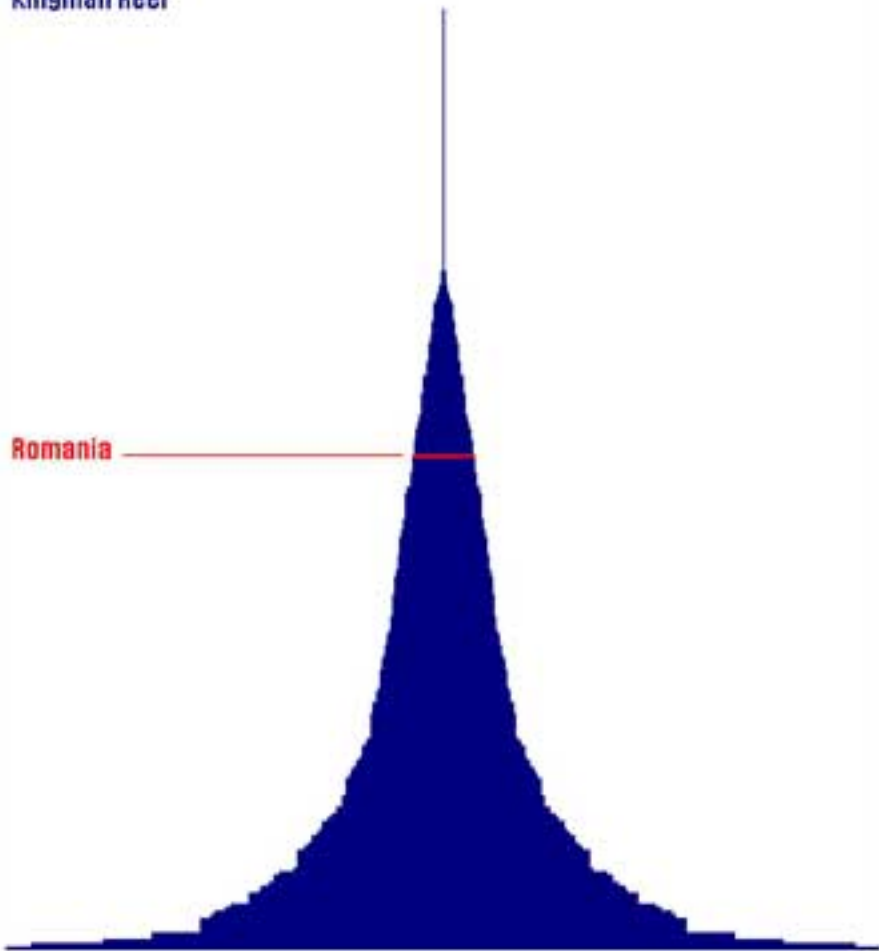
Korea, South: 3.6% (2004 est.)
 Cayman Islands: 4.1% (1997)
 New Zealand: 4.2% (2004 est.)
 Norway: 4.3% (2004 est.)
 Ireland: 4.3% (2004 est.)
 Austria: 4.4% (2004 est.)
 Luxembourg: 4.5% (December, 2004 est.)
 Saint Kitts and Nevis: 4.5% (1997)
 Taiwan: 4.5% (2004 est.)
 Macau: 4.7% (3rd Quarter, 2004)
 Japan: 4.7% (2004 est.)
 United Kingdom: 4.8% (2004 est.)
 Bermuda: 5% (2002 est.)
 Australia: 5.1% (December 2004 est.)
 Burma: 5.2% (2004 est.)
 United States: 5.5% (2004 est.)
 Sweden: 5.6% (2004 est.)
 Laos: 5.7% (1997 est.)
 Hungary: 5.9% (2004 est.)
 Netherlands: 6% (2004 est.)
 Montserrat: 6% (1998 est.)
 American Samoa: 6% (2000)
 Denmark: 6.2% (2004 est.)
 Romania: 6.3% (2004 est.)
 El Salvador: 6.3% - but the economy has much underemployment (2004 e
 Slovenia: 6.4% (2004 est.)
 Portugal: 6.5% (2004 est.)
 Costa Rica: 6.6% (2004 est.)
 Hong Kong: 6.7% (2004 est.)
 Mongolia: 6.7% (2003)
 Malta: 7% (2003 est.)
 Canada: 7% (2004)
 Guatemala: 7.5% (2003 est.)
 Fiji: 7.6% (1999)
 Nicaragua: 7.8% plus underemployment of 46.5% (2003 est.)
 Sri Lanka: 7.8% (2004 est.)
 Central African Republic: 8% (23% for Bangui) (2001 est.)
 Moldova: 8% (roughly 25% of working age Moldovans are employed abroa
 Lithuania: 8% (2004 est.)
 Anguilla: 8% (2002)
 Kazakhstan: 8% (2004 est.)
 Pakistan: 8.3% plus substantial underemployment (2004 est.)
 Russia: 8.3% plus considerable underemployment (2004 est.)
 Chile: 8.5% (2004 est.)
 Italy: 8.6% (2004 est.)
 Latvia: 8.8% (2004 est.)
 Finland: 8.9% (2004 est.)

UNEMPLOYMENT RATE

Kingman Reef

Romania

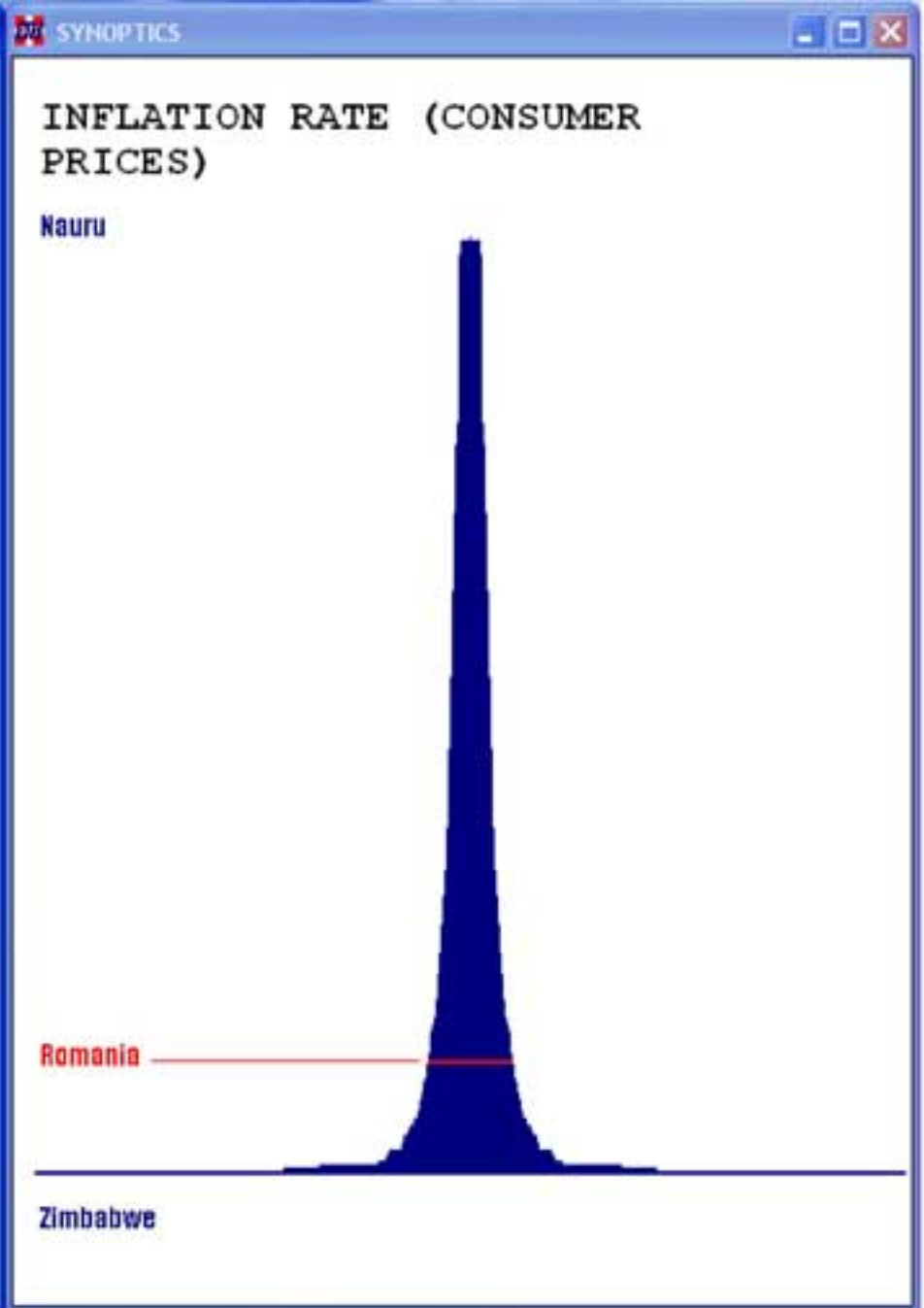
Nauru



FEATURE: Inflation rate (consumer prices)

Files Data File Edit

Swaziland:	5.4%	(2004 est.)
Tanzania:	5.4%	(2004 est.)
Mexico:	5.4%	(2004 est.)
Georgia:	5.5%	(2004 est.)
Philippines:	5.5%	(2004 est.)
Sri Lanka:	5.8%	(2004 est.)
Colombia:	5.9%	(2004 est.)
Latvia:	6%	(2004 est.)
Bangladesh:	6%	(2004 est.)
Indonesia:	6.1%	(2004 est.)
Bulgaria:	6.1%	(2004 est.)
Argentina:	6.1%	(2004 est.)
Puerto Rico:	6.5%	(2003 est.)
Kazakhstan:	6.9%	(2004 est.)
Gambia, The:	7%	(2004 est.)
Mauritania:	7%	(2003 est.)
Botswana:	7%	(2004 est.)
Rwanda:	7%	(2004 est.)
Honduras:	7%	(2004 est.)
Hungary:	7%	(2004 est.)
Guatemala:	7.2%	(2004 est.)
Madagascar:	7.5%	(2004 est.)
Slovakia:	7.5%	(2004 est.)
Brazil:	7.6%	(2004 est.)
Uruguay:	7.6%	(2004 est.)
Tajikistan:	8%	(2004 est.)
Chad:	8%	(2004 est.)
Equatorial Guinea:	8.5%	(2004 est.)
Burundi:	8.5%	(2004 est.)
Serbia and Montenegro:	8.8%	(2004 est.)
Turkmenistan:	9%	(2004 est.)
Kenya:	9%	(2004 est.)
Sudan:	9%	(2004 est.)
Nicaragua:	9.3%	(2004 est.)
Turkey:	9.3%	(2004 est.)
Vietnam:	9.5%	(2004 est.)
Egypt:	9.5%	(2004 est.)
Romania:	9.6%	(2004 est.)
Solomon Islands:	10%	(2003 est.)
Eritrea:	10%	(2004 est.)
Afghanistan:	10.3%	(2003)
Tonga:	10.3%	(2002 est.)
Mongolia:	11%	(2004 est.)
Russia:	11.5%	(2004 est.)
Costa Rica:	11.5%	(2004 est.)
Moldova:	11.5%	(2004 est.)
Ukraine:	12%	(2004 est.)

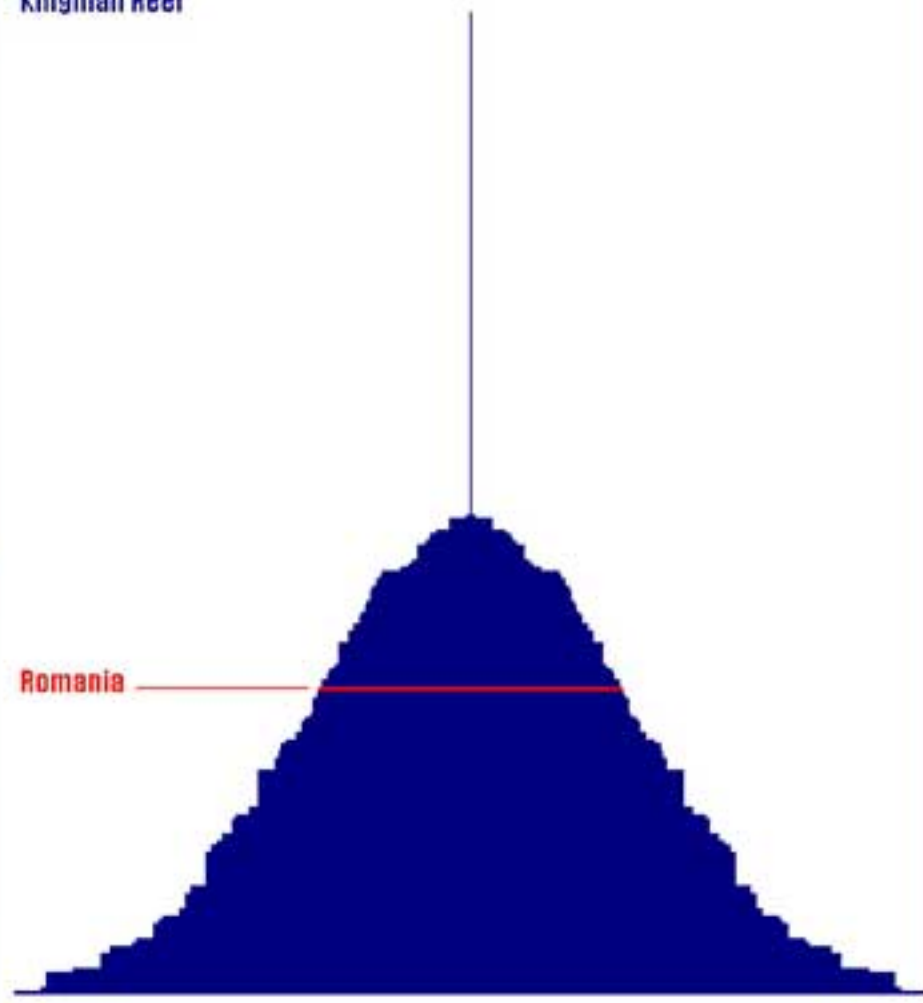


Files Data File Edit

Egypt:	16.7%	(2000 est.)
United Kingdom:	17%	(2002 est.)
Israel:	18%	(2001 est.)
Costa Rica:	18%	(2004 est.)
Poland:	18.4%	(2000 est.)
Bermuda:	19%	(2000)
Morocco:	19%	(1999 est.)
Kazakhstan:	19%	(2004 est.)
Jamaica:	19.7%	(2002 est.)
Turkey:	20%	(2002)
Syria:	20%	(2004 est.)
Chile:	20.6%	(2000)
Uruguay:	21%	of households (2003)
Trinidad and Tobago:	21%	(1992 est.)
Sri Lanka:	22%	(1997 est.)
Brazil:	22%	(1998 est.)
Algeria:	23%	(1999 est.)
Guam:	23%	(2001 est.)
Anguilla:	23%	(2002)
India:	25%	(2002 est.)
Russia:	25%	(January 2003 est.)
Dominican Republic:	25%	
Bosnia and Herzegovina:	25%	(2004 est.)
Albania:	25%	(2004 est.)
Burma:	25%	(2000 est.)
Fiji:	25.5%	(1990-91)
Micronesia, Federated States of:	26.7%	
Indonesia:	27%	(1999)
Belarus:	27.1%	(2003 est.)
Uzbekistan:	28%	(2004 est.)
Lebanon:	28%	(1999 est.)
Romania:	28.9%	(2002)
Vietnam:	28.9%	(2002 est.)
Ukraine:	29%	(2003 est.)
Serbia and Montenegro:	30%	(1999 est.)
Jordan:	30%	(2001 est.)
Dominica:	30%	(2002 est.)
Cape Verde:	30%	(2000)
Macedonia:	30.2%	(2003 est.)
Ghana:	31.4%	(1992 est.)
Grenada:	32%	(2000)
Pakistan:	32%	(FY00/01 est.)
Togo:	32%	(1989 est.)
Benin:	33%	(2001 est.)
Belize:	33%	(1999 est.)
Uganda:	35%	(2001 est.)
Paraguay:	36%	(2001 est.)

POPULATION BELOW POVERTY LINE

Kingman Reef



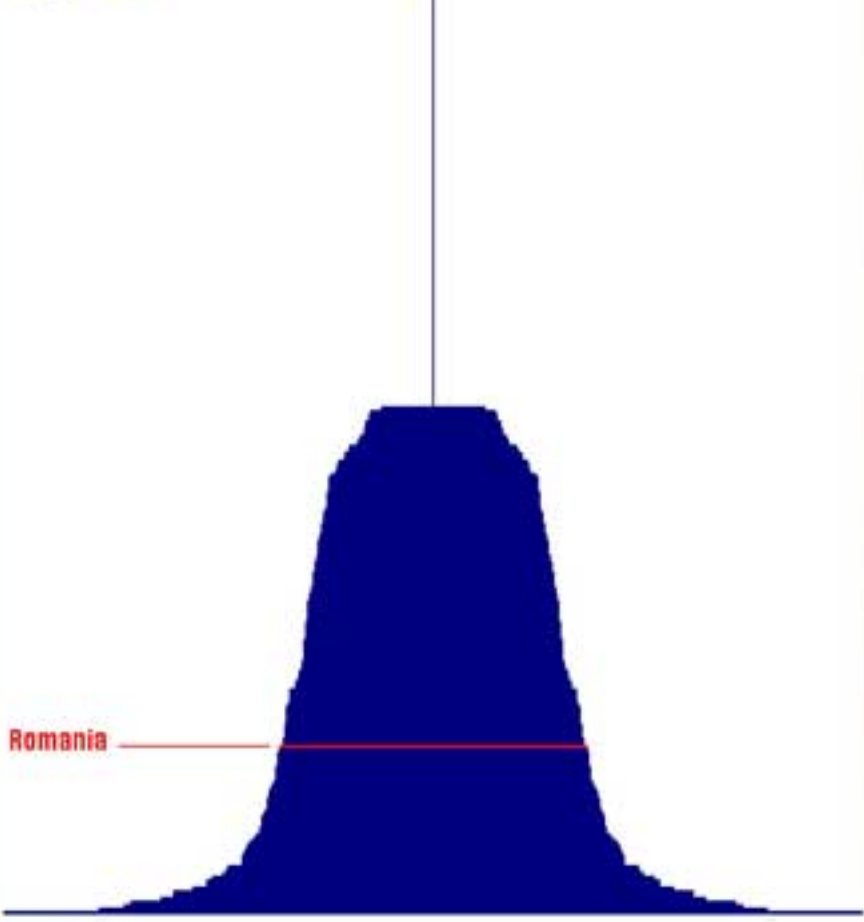
Zambia

Files Data File Edit

Benin: 19.3% of GDP (2004 est.)
Italy: 19.3% of GDP (2004 est.)
Trinidad and Tobago: 19.4% of GDP (2004 est.)
Canada: 19.4% of GDP (2004 est.)
Mexico: 19.4% of GDP (2004 est.)
Namibia: 19.6% of GDP (2004 est.)
Ghana: 19.7% of GDP (2004 est.)
Armenia: 19.8% of GDP (2004 est.)
Brazil: 19.8% of GDP (2004 est.)
Denmark: 19.8% of GDP (2004 est.)
Luxembourg: 19.8% of GDP (2004 est.)
Netherlands: 19.9% of GDP (2004 est.)
Rwanda: 20% of GDP (2004 est.)
Senegal: 20.1% of GDP (2004 est.)
Switzerland: 20.4% of GDP (2004 est.)
Ecuador: 20.6% of GDP (2004 est.)
United Arab Emirates: 20.8% of GDP (2004 est.)
Cambodia: 20.9% of GDP (2004 est.)
Guinea: 21% of GDP (2004 est.)
Malaysia: 21.7% of GDP (2004 est.)
Gabon: 21.8% of GDP (2004 est.)
Belarus: 21.8% of GDP (2004 est.)
Lithuania: 21.9% of GDP (2004 est.)
Tajikistan: 22% of GDP (2004 est.)
Portugal: 22.3% of GDP (2004 est.)
Sri Lanka: 22.4% of GDP (2004 est.)
Morocco: 22.4% of GDP (2004 est.)
New Zealand: 22.4% of GDP (2004 est.)
Uganda: 22.4% of GDP (2004 est.)
Thailand: 22.5% of GDP (Jan - Sep 2004 est.)
Mauritius: 22.5% of GDP (2004 est.)
Austria: 22.6% of GDP (2004 est.)
Hong Kong: 22.7% of GDP (2004 est.)
Hungary: 22.8% of GDP (2004 est.)
Qatar: 22.9% of GDP (2004 est.)
Romania: 23.3% of GDP (2004 est.)
Bangladesh: 23.5% of GDP (2004 est.)
Swaziland: 23.6% of GDP (2004 est.)
India: 23.8% of GDP (2004 est.)
Iceland: 23.9% of GDP (2004 est.)
Ireland: 23.9% of GDP (2004 est.)
Chile: 23.9% of GDP (2004 est.)
Kazakhstan: 23.9% of GDP (2004 est.)
Slovakia: 24% of GDP (2004 est.)
Japan: 24% of GDP (2004 est.)
Honduras: 24.1% of GDP (2004 est.)
Tunisia: 24.5% of GDP (2004 est.)

INVESTMENT (GROSS FIXED)

Kingman Reef



Romania

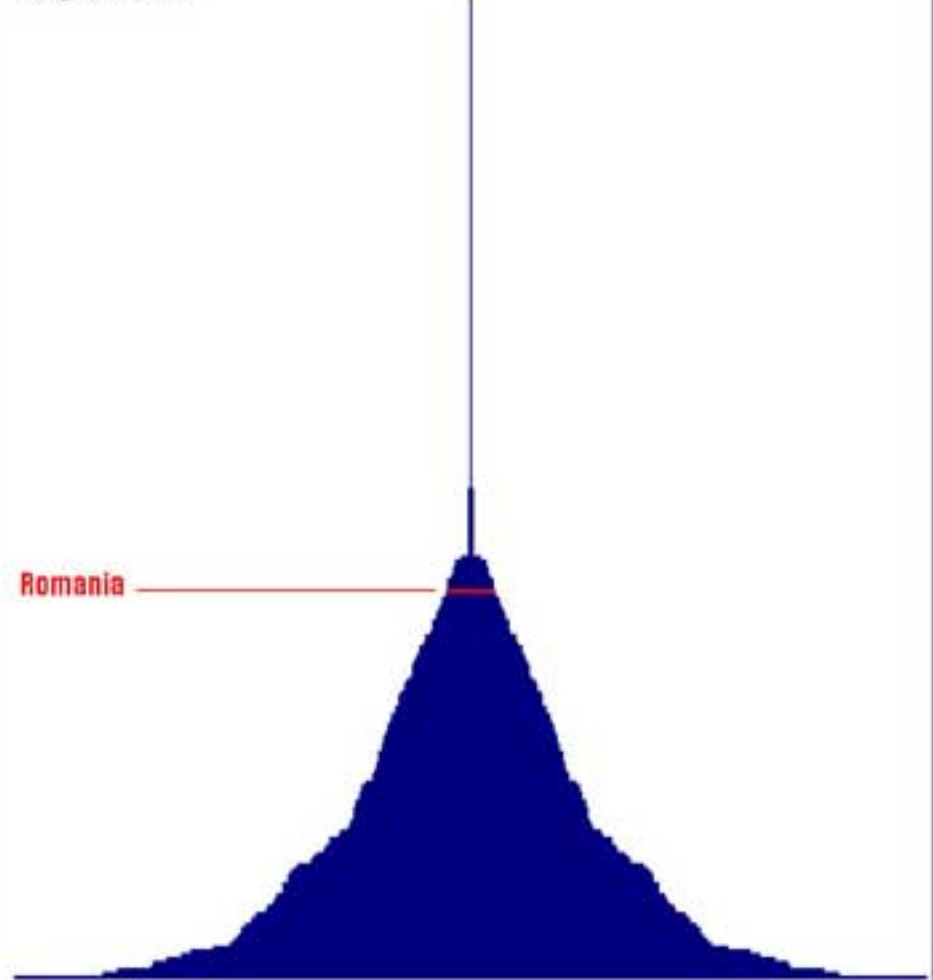
Azerbaijan

Files Data File Edit

Cocos (Keeling) Islands: none
 Korea, North: none
 Tokelau: none
 Qatar: none
 Saint Helena: none
 Vietnam: none
 Christmas Island: none
 Oman: none
 Falkland Islands (Islas Malvinas): none
 Maldives: none
 Guernsey: none
 Jersey: none
 Norfolk Island: none
 Saudi Arabia: none
 Tuvalu: none
 Western Sahara: none
 Man, Isle of: none
 Pitcairn Islands: none
 Mauritius: various labor unions
 Sierra Leone: trade unions and student unions
 Trinidad and Tobago: Jamaat-al Muslimeen (Yasin BAKR)
 Armenia: Yerkrapah Union (Manvel GRIGORIAN)
 Seychelles: Roman Catholic Church; trade unions
 Rwanda: IBUKA - association of genocide survivors
 Tajikistan: there are three unregistered political parties
 Senegal: labor; Muslim brotherhoods; students; teachers
 Kuwait: several political groups act as de facto parties
 Romania: various human rights and professional associations
 Uganda: Popular Resistance Against a Life President or PRALP
 Holy See (Vatican City): none (exclusive of influence exercised by c
 Dominica: Dominica Liberation Movement or DLM (a small leftist party
 Czech Republic: Bohemian and Moravian Trade Union Confederation (Mil
 Somalia: numerous clan and subclan factions are currently vying for
 Tunisia: the Islamic fundamentalist party, Al Nahda (Renaissance), i
 Taiwan: Taiwan independence movement, various business and environme
 Belize: Society for the Promotion of Education and Research or SPEAR
 Latvia: Headquarters for the Protection of Russian Schools (SHTAB) (
 Tonga: Human Rights and Democracy Movement Tonga or HDDMT (Rev. Sino
 Gibraltar: Chamber of Commerce; Gibraltar Representatives Organizati
 Laos: noncommunist political groups proscribed; most opposition lead
 Mali: Patriotic Movement of the Ghanda Koye or MPCK; United Movement
 Jamaica: New Beginnings Movement or NBM; Rastafarians (black religio
 Germany: business associations, employers' organizations; expellee,
 Angola: Front for the Liberation of the Enclave of Cabinda or FLEC (
 Cameroon: Southern Cameroon National Council (Ayaaba Ette OTUN); Hum
 Antigua and Barbuda: Antigua Trades and Labor Union or ATLU (William
 United Kingdom: Campaign for Nuclear Disarmament; Confederation of B

POLITICAL PRESSURE GROUPS AND LEADERS

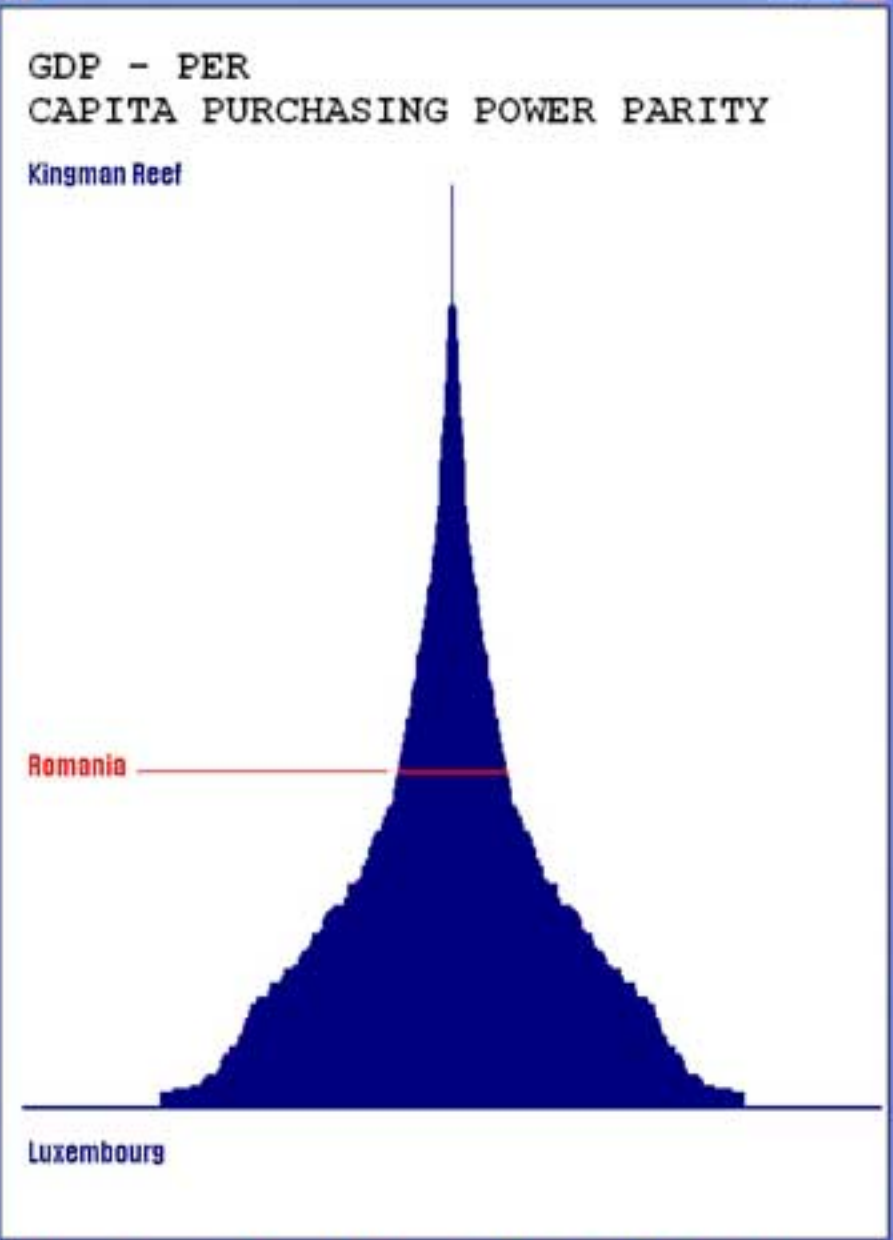
Kingman Reef



Nicaragua

Files Data File Edit

Lebanon:	5,000	(2004 est.)
Cook Islands:	5,000	(2001 est.)
Swaziland:	5,100	(2004 est.)
Saint Lucia:	5,400	(2002 est.)
Dominica:	5,500	(2003 est.)
Peru:	5,600	(2004 est.)
Samoa:	5,600	(2002 est.)
China:	5,600	(2004 est.)
Turkmenistan:	5,700	(2004 est.)
Venezuela:	5,800	(2004 est.)
Gabon:	5,900	(2004 est.)
Fiji:	5,900	(2004 est.)
Reunion:	6,000	(2004 est.)
Ukraine:	6,300	(2004 est.)
Dominican Republic:	6,300	(2004 est.)
Bosnia and Herzegovina:	6,500	(2004 est.)
Belize:	6,500	(2004 est.)
Colombia:	6,600	(2004 est.)
Algeria:	6,600	(2004 est.)
Libya:	6,700	(2004 est.)
Belarus:	6,800	(2004 est.)
Panama:	6,900	(2004 est.)
Saint Pierre and Miquelon:	7,000	(2001 est.)
Tunisia:	7,100	(2004 est.)
Macedonia:	7,100	(2004 est.)
Namibia:	7,300	(2004 est.)
Turkey:	7,400	(2004 est.)
Anguilla:	7,500	(2002 est.)
Romania:	7,700	(2004 est.)
Iran:	7,700	(2004 est.)
Seychelles:	7,800	(2002 est.)
Kazakhstan:	7,800	(2004 est.)
Guadeloupe:	7,900	(2003 est.)
American Samoa:	8,000	(2000 est.)
Brazil:	8,100	(2004 est.)
Thailand:	8,100	(2004 est.)
Bulgaria:	8,200	(2004 est.)
French Guiana:	8,300	(2003 est.)
Saint Kitts and Nevis:	8,800	(2002 est.)
Palau:	9,000	(2001 est.)
Botswana:	9,200	(2004 est.)
Costa Rica:	9,600	(2004 est.)
Mexico:	9,600	(2004 est.)
Malaysia:	9,700	(2004 est.)
Russia:	9,800	(2004 est.)
Trinidad and Tobago:	10,500	(2004 est.)
Chile:	10,700	(2004 est.)



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Saint Vincent and the Grenadines: 96%
 San Marino: 96%
 Taiwan: 96.1% (2003)
 Chile: 96.2%
 Netherlands Antilles: 96.7%
 Saint Kitts and Nevis: 97%
 Canada: 97% (1986 est.)
 American Samoa: 97%
 Saint Helena: 97%
 Montserrat: 97%
 Kyrgyzstan: 97%
 Northern Mariana Islands: 97%
 Aruba: 97%
 Cuba: 97%
 United States: 97%
 Azerbaijan: 97%
 Argentina: 97.1%
 Maldives: 97.2%
 Barbados: 97.4%
 Greece: 97.5%
 Cyprus: 97.6%
 Martinique: 97.7%
 Mongolia: 97.8%
 British Virgin Islands: 97.8% (1991 est.)
 Korea, South: 97.9%
 Spain: 97.9%
 Uruguay: 98%
 Grenada: 98%
 Austria: 98%
 Turkmenistan: 98%
 Belgium: 98%
 Turks and Caicos Islands: 98%
 French Polynesia: 98%
 Bermuda: 98%
 Cayman Islands: 98%
 Ireland: 98% (1981 est.)
 Romania: 98.4%
 Kazakhstan: 98.4%
 Croatia: 98.5%
 Tonga: 98.5%
 Armenia: 98.6%
 Bulgaria: 98.6%
 Trinidad and Tobago: 98.6%
 Italy: 98.6%
 Guyana: 98.8%
 Saint Pierre and Miquelon: 99%
 Monaco: 99%

LITERACY TOTAL POPULATION

Kingman Reef

Romania

Liechtenstein

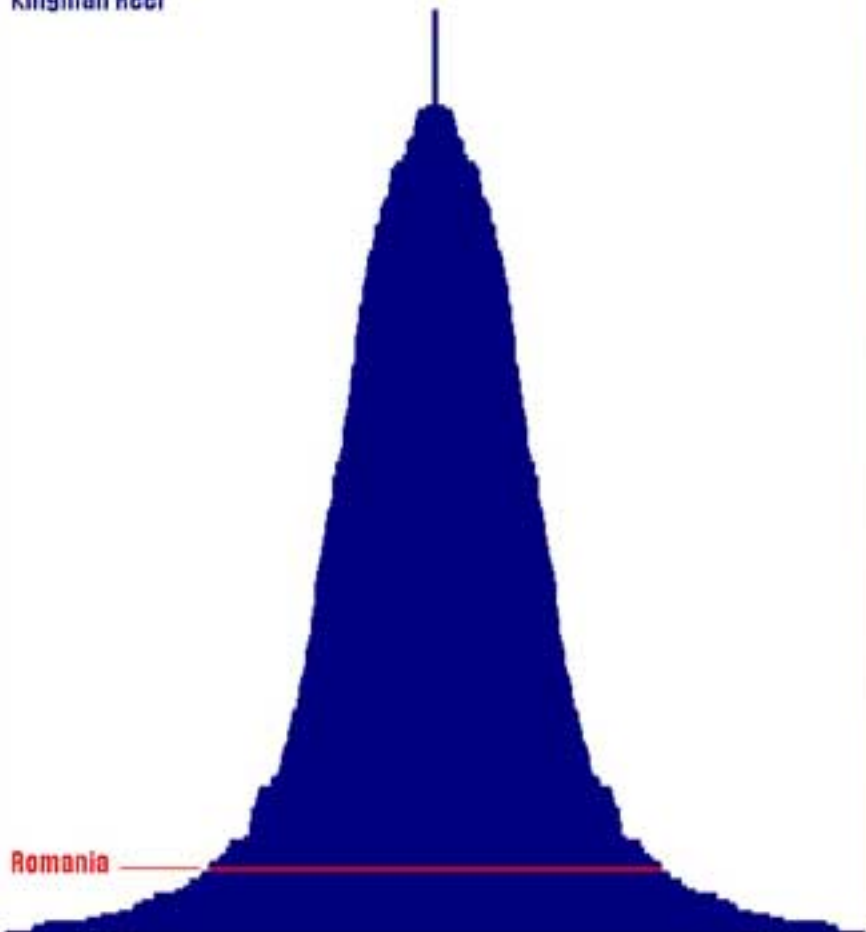
Argentina: nominally Roman Catholic 92% (less than 20% practicing),
 Burma: Buddhist 89%, Christian 4% (Baptist 3%, Roman Catholic 1%), M
 Tuvalu: Church of Tuvalu (Congregationalist) 97%, Seventh-Day Advent
 Cape Verde: Roman Catholic (infused with indigenous beliefs); Protes
 Tanzania: mainland - Christian 30%, Muslim 35%, indigenous beliefs 3
 Trinidad and Tobago: Roman Catholic 29.4%, Hindu 23.8%, Anglican 10.
 Saint Vincent and the Grenadines: Anglican 47%, Methodist 20%, Roman
 Gibraltar: Roman Catholic 76.9%, Church of England 6.9%, Muslim 6.9%
 Northern Mariana Islands: Christian (Roman Catholic majority, althou
 Anguilla: Anglican 40%, Methodist 33%, Seventh-Day Adventist 7%, Bap
 Yemen: Muslim including Shaf'i (Sunni) and Zaydi (Shi'a), small numb
 Sudan: Sunni Muslim 70% (in north), indigenous beliefs 25%, Christia
 Croatia: Roman Catholic 87.8%, Orthodox 4.4%, Muslim 1.3%, Protestan
 United States: Protestant 52%, Roman Catholic 24%, Mormon 2%, Jewish
 Montserrat: Anglican, Methodist, Roman Catholic, Pentecostal, Sevent
 Belarus: Eastern Orthodox 80%, other (including Roman Catholic, Prot
 India: Hindu 81.3%, Muslim 12%, Christian 2.3%, Sikh 1.9%, other gro
 Rwanda: Roman Catholic 56.5%, Protestant 26%, Adventist 11.1%, Musli
 Malaysia: Muslim, Buddhist, Daoist, Hindu, Christian, Sikh; note - i
 Barbados: Protestant 67% (Anglican 40%, Pentecostal 8%, Methodist 7%
 Korea, North: traditionally Buddhist and Confucianist, some Christia
 Costa Rica: Roman Catholic 76.3%, Evangelical 13.7%, Jehovah's Witne
 Congo, Democratic Republic of the: Roman Catholic 50%, Protestant 20
 Vietnam: Buddhist, Hoa Hao, Cao Dai, Christian (predominantly Roman
 Lithuania: Roman Catholic (primarily), Lutheran, Russian Orthodox, P
 Suriname: Hindu 27.4%, Protestant 25.2% (predominantly Moravian), No
 Haiti: Roman Catholic 80%, Protestant 16% (Baptist 10%, Pentecostal
 Zimbabwe: syncretic (part Christian, part indigenous beliefs) 50%, C
 Italy: predominately Roman Catholic with mature Protestant and Jewis
 Cayman Islands: United Church (Presbyterian and Congregational), Ang
 Norway: Evangelical Lutheran 86% (state church), other Protestant an
 Falkland Islands (Islas Malvinas): primarily Anglican, Roman Catholi
 Bulgaria: Bulgarian Orthodox 82.6%, Muslim 12.2%, Roman Catholic 1.7
 New Zealand: Anglican 24%, Presbyterian 18%, Roman Catholic 15%, Met
 Bahamas, The: Baptist 32%, Anglican 20%, Roman Catholic 19%, Methodi
 Dominica: Roman Catholic 77%, Protestant 15% (Methodist 5%, Pentecos
 Cuba: nominally 85% Roman Catholic prior to CASTRO assuming power; P
 Uruguay: Roman Catholic 66% (less than half of the adult population
 Kiribati: Roman Catholic 52%, Protestant (Congregational) 40%, some
 Romania: Eastern Orthodox (including all sub-denominations) 87%, Pro
 United Kingdom: Anglican and Roman Catholic 40 million, Muslim 1.5 m
 Norfolk Island: Anglican 37.4%, Uniting Church in Australia 14.5%, P
 Solomon Islands: Anglican 45%, Roman Catholic 18%, United (Methodist
 Estonia: Evangelical Lutheran, Russian Orthodox, Estonian Orthodox,
 Syria: Sunni Muslim 74%, Alawite, Druze, and other Muslim sects 16%
 Swaziland: Zionist (a blend of Christianity and indigenous ancestral
 South Africa: Christian 68% (includes most whites and Coloreds, abou

RELIGIONS

Kingman Reef

Romania

Jamaica



Files Data File Edit

Iceland: homogeneous mixture of descendants of Norse and Celts 94%

Estonia: Estonian 65.3%, Russian 28.1%, Ukrainian 2.5%, Belarusian 1

Botswana: Tswana (or Setswana) 79%, Kalanga 11%, Basarwa 3%, other,

Georgia: Georgian 70.1%, Armenian 8.1%, Russian 6.3%, Azeri 5.7%, Os

Nepal: Brahma, Chetri, Newar, Gurung, Magar, Tamang, Rai, Limbu, Sh

Northern Mariana Islands: Chamorro, Carolinians and other Micronesia

Eritrea: ethnic Tigrinya 50%, Tigre and Kunama 40%, Afar 4%, Saho (R

Benin: African 99% (42 ethnic groups, most important being Fon, Adja

Mexico: mestizo (Amerindian-Spanish) 60%, Amerindian or predominant

Gambia, The: African 99% (Mandinka 42%, Fula 18%, Wolof 16%, Jola 10

Libya: Berber and Arab 97%, Greeks, Maltese, Italians, Egyptians, Pa

Puerto Rico: white (mostly Spanish origin) 80.5%, black 8%, Amerindi

Ethiopia: Oromo 40%, Amhara and Tigre 32%, Sidamo 9%, Shannella 6,

Uzbekistan: Uzbek 80%, Russian 5.5%, Tajik 5%, Kazakh 3%, Karakalpak

Albania: Albanian 95%, Greek 3%, other 2% (Vlach, Roma (Gypsy), Serb

Mali: Mande 50% (Bambara, Malinke, Soninke), Peul 17%, Voltaic 12%,

Kyrgyzstan: Kyrgyz 64.9%, Uzbek 13.8%, Russian 12.5%, Dungan 1.1%, U

New Zealand: New Zealand European 74.5%, Maori 9.7%, other European

Bulgaria: Bulgarian 83.9%, Turk 9.4%, Roma 4.7%, other 2% (including

Panama: mestizo (mixed Amerindian and white) 70%, Amerindian and mix

Grenada: black 82%, mixed black and European 13%, European and East

Mongolia: Mongol (mostly Khalkha) 94.9%, Turkic (mostly Kazakh) 5,

Peru: Amerindian 45%, mestizo (mixed Amerindian and white) 37%, whit

Guinea-Bissau: African 99% (Balanta 30%, Fula 20%, Manjaca 14%, Mand

Iran: Persian 51%, Azeri 24%, Gilaki and Mazandarani 8%, Kurd 7%, Ar

Latvia: Latvian 57.7%, Russian 29.6%, Belarusian 4.1%, Ukrainian 2.7

Japan: Japanese 99%, others 1% (Korean 511,262, Chinese 244,241, Bra

New Caledonia: Melanesian 42.5%, European 37.1%, Wallisian 8.4%, Pol

Equatorial Guinea: Bioko (primarily Bubi, some Fernandinos), Rio Mun

Kazakhstan: Kazakh (Qazaq) 53.4%, Russian 30%, Ukrainian 3.7%, Uzbek

Angola: Ovimbundu 37%, Kimbundu 25%, Bakongo 13%, mestizo (mixed Eur

United Kingdom: English 81.5%, Scottish 9.6%, Irish 2.4%, Welsh 1.9%

Senegal: Wolof 43.3%, Fular 23.8%, Serer 14.7%, Jola 3.7%, Mandinka

Moldova: Moldovan/Romanian 64.5%, Ukrainian 13.8%, Russian 13%, Jevi

Germany: German 91.5%, Turkish 2.4%, other 6.1% (made up largely of

China: Han Chinese 91.9%, Zhuang, Uyghur, Hui, Yi, Tibetan, Miao, Man

Romania: Romanian 89.5%, Hungarian 6.6%, Roma 2.5%, Ukrainian 0.3%

Russia: Russian 81.5%, Tatar 3.8%, Ukrainian 3%, Chuvash 1.2%, Bashk

Cook Islands: Polynesian (full blood) 81.3%, Polynesian and European

Pakistan: Punjabi, Sindhi, Pashtun (Pathan), Baloch, Muhajir (immigr

United Arab Emirates: Emirati 19%, other Arab and Iranian 23%, South

Malta: Maltese (descendants of ancient Carthaginians and Phoenicians

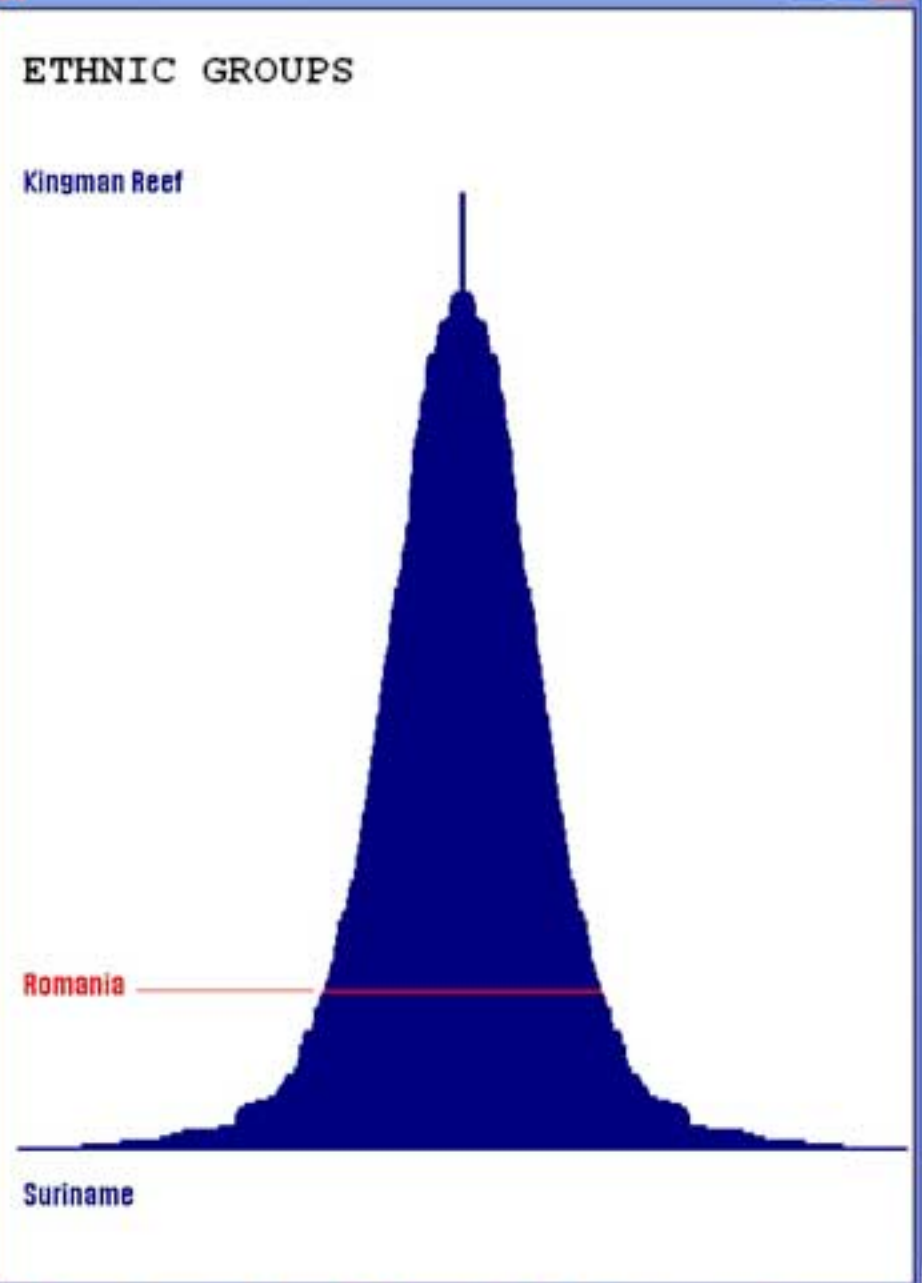
Mozambique: indigenous tribal groups 99.66% (Makhuva, Tsonga, Loave,

Bhutan: Bhote 50%, ethnic Nepalese 35% (includes Lhotsampas - one of

Togo: native African (37 tribes; largest and most important are Ewe,

Argentina: white (mostly Spanish and Italian) 97%, mestizo (mixed wh

Czech Republic: Czech 81.2%, Moravian 13.2%, Slovak 3.1%, Polish 0.6



Potential Hazards



A Dirty Bomb Attack on Norfolk Harbor

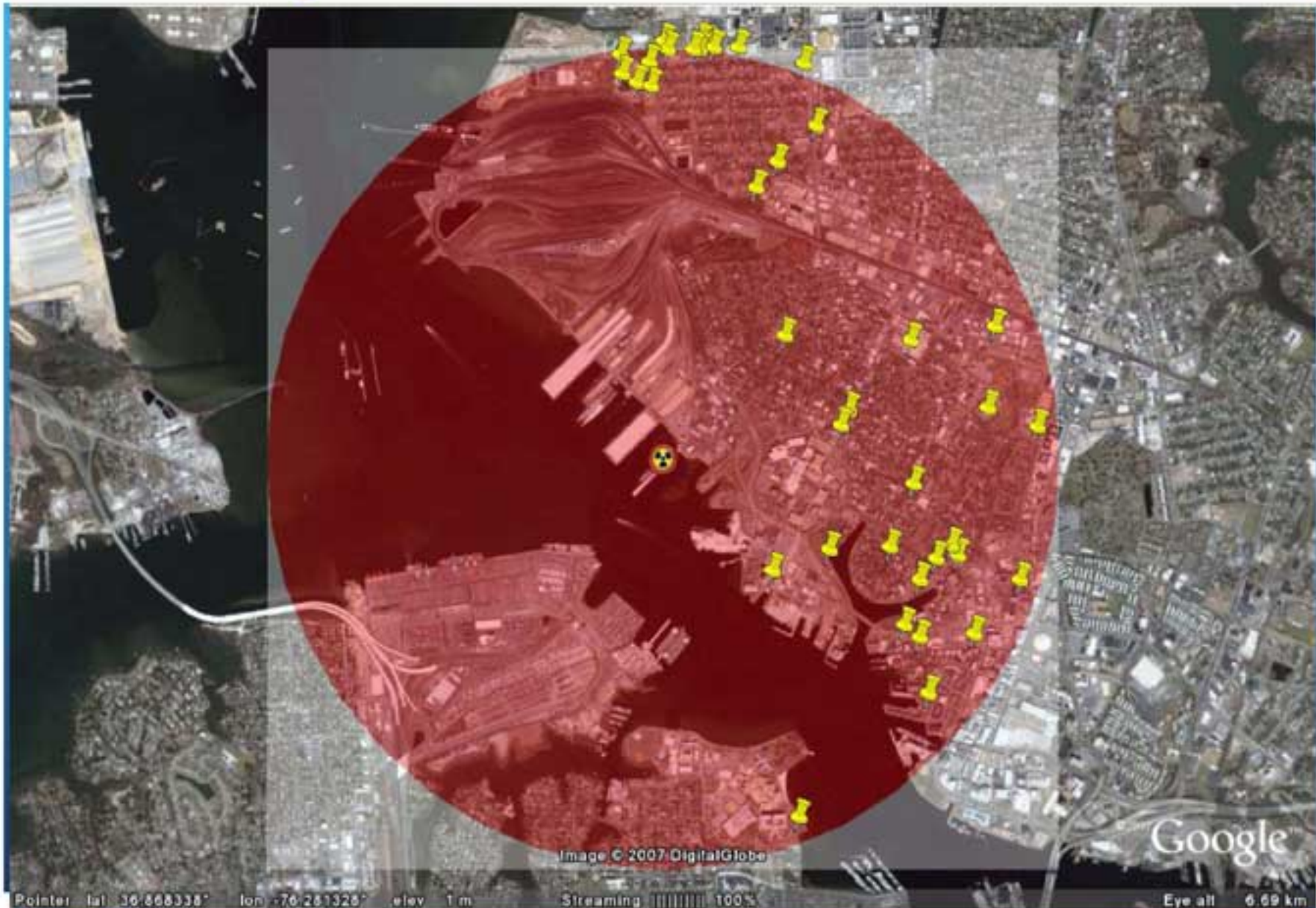


Image © 2007 DigitalGlobe

Google

Pointer lat: 36.868338° lon: -76.281328° elev: 1 m

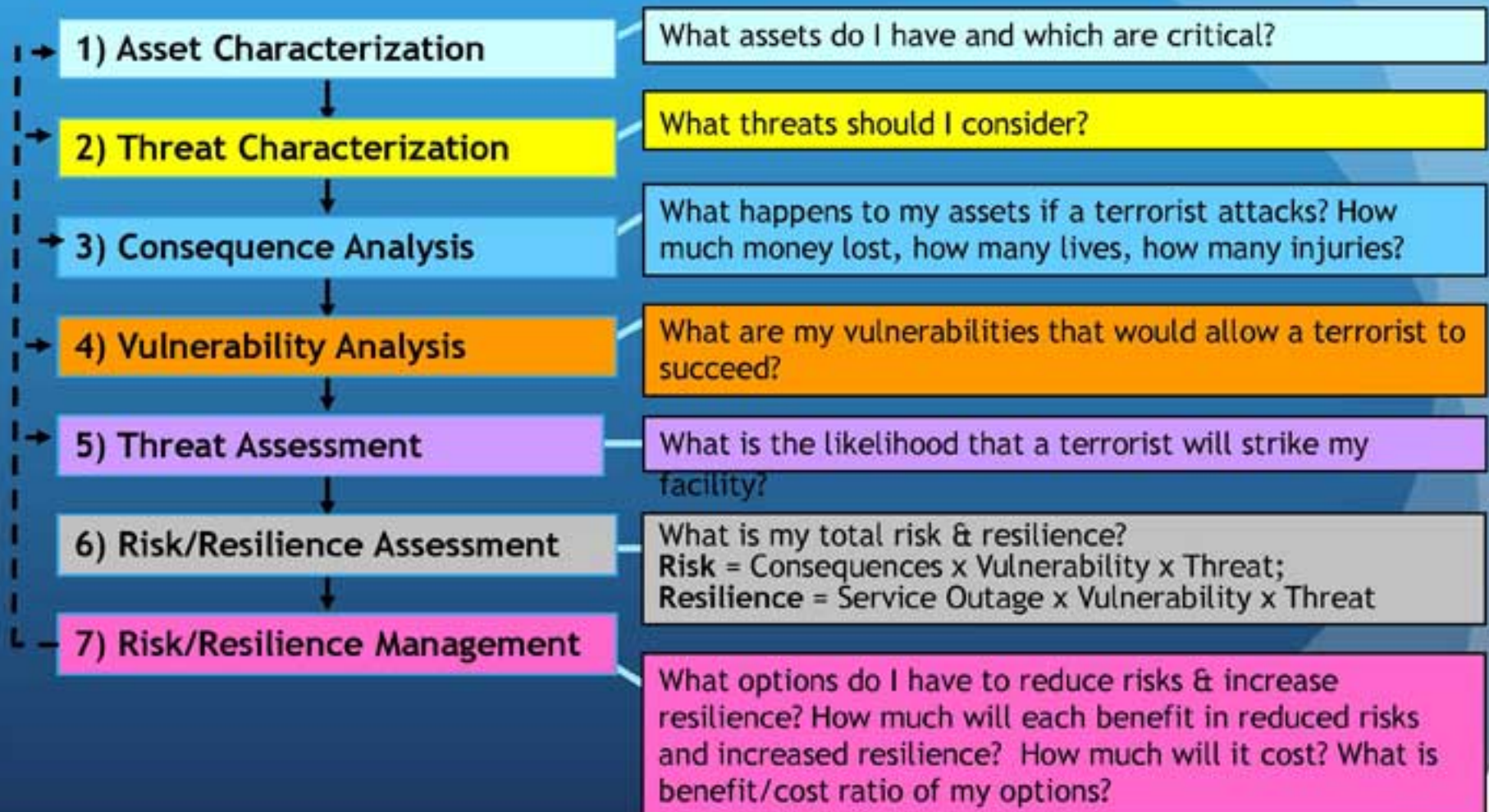
Streaming [|||||] 100%

Eye alt: 6.69 km

Risk/Resilience Analysis Process

Risk = f(Threat, Vulnerability, Consequences)

Resilience = f(Outage Duration, Outage Severity, Vulnerability, Consequences)



From Infrastructure Assurance to Mission Assurance - Timeline

Expand
Infrastructure
analysis to
additional
infrastructures.
Initiate IAP



JPO-STC
Created

DPO-MA Created
Funding centralized

- Conduct Prototype 1
- First "CIP" Funding (Y2K supplemental)

9/11

1994

1998

2000

2002

2005

1993

1995

1999

2001

2003



Initiate
Infrastructure
analysis on electric
power

- PDD 63 Issued
- DODD 5160.54 Issued
- DoD CIP Plan Issued

First "CIP" Assessments
Sponsored & directed
by ASD-C3I

- Initiate App 16 work w/PACOM
- Received 1st DERF funding
- Initiate NSSE work (2002 Winter Olympics)

- DPO-MA reverts to Mission Assurance Division
- DODD 3020.40 signed

From Infrastructure Assurance to Mission Assurance - Timeline (Cont'd)

OASD(HD) transitions from HD (DCIP) as sole sponsor of MAD To DCIP community sponsorship

MAD Initiates work for Department of Homeland Security (DHS) - Infrastructure Information Collection System (IICS) contract

2007

2006

MAD expanded work with new sponsors:

- DISA
- DIA
- ISR
- JWAC
- NASA
- Army
- DHS
- DoE

2008

US Army and NASA initiate MAD on-site assessments

MAD completes Department of Defense Integrated Risk Assessment Handbook for OASD(HD)

VISION



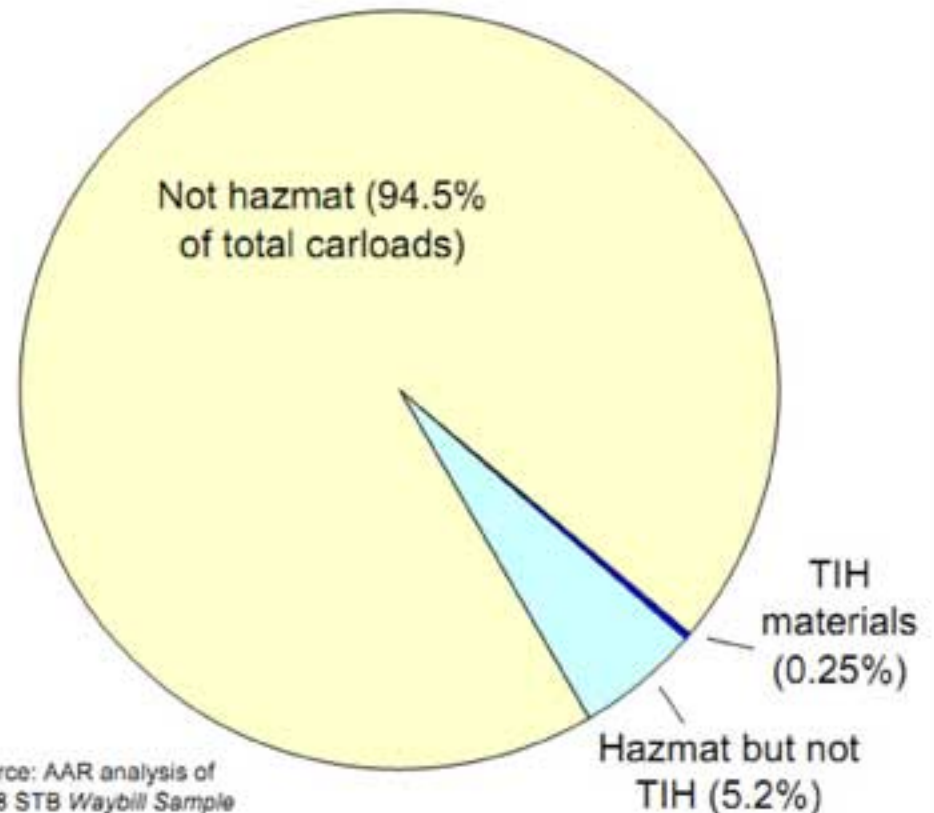
Railroad Hazardous Materials Transportation Risk Management Framework



Overview of railroad hazardous materials transportation

- There were 1.7 million rail carloads of hazardous materials (hazmat) in the U.S. in 2010 (AAR, 2011)
- Hazmat traffic account for a small proportion of total rail carloads, but its safety have been placed a high priority

Hazardous materials, including TIH materials, are a small percentage of rail traffic but are responsible for a major share of rail insurance costs and liability risks.

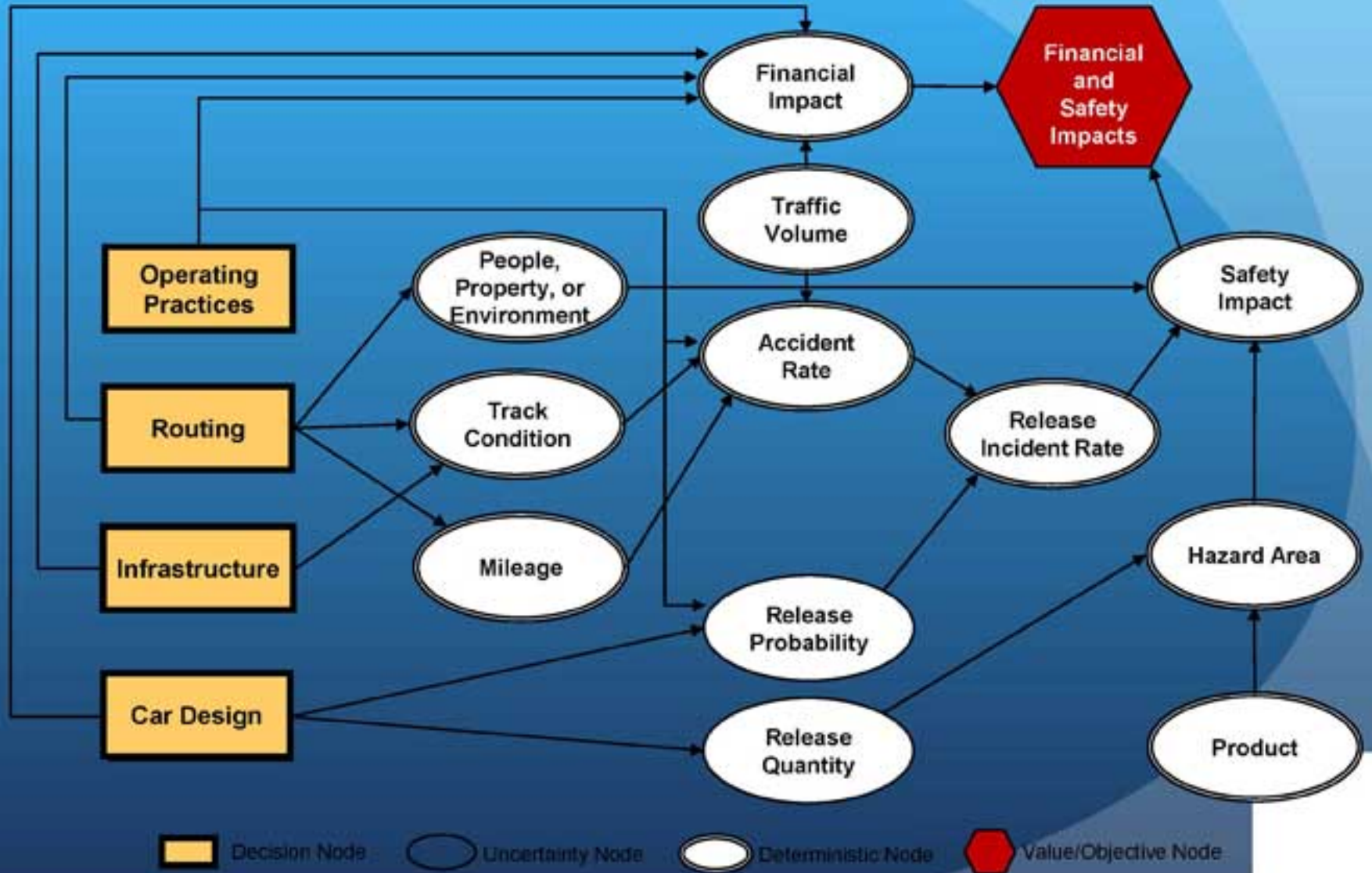


Source: AAR analysis of 2008 STB Waybill Sample

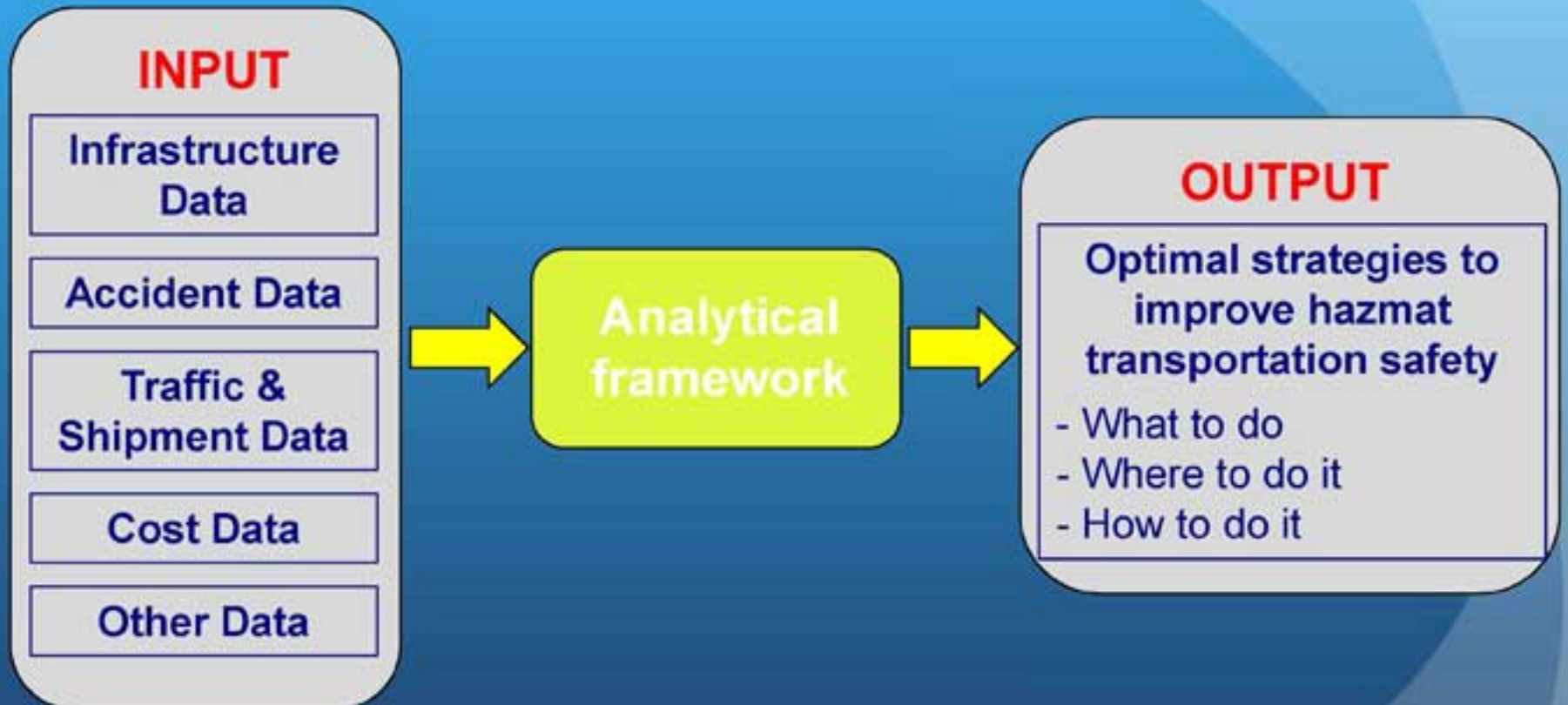
Safety of railroad hazmat transportation

- 99.998% of rail hazmat shipments reached their destinations without a train-accident-caused release in 2008 (AAR, 2011)
- Train-accident-caused hazmat release rates have declined by about 90% since 1982
 - about 200 cars released per million carloads in 1982
 - about 21 cars released per million carloads in 2010
- Further improvement in the transportation safety remains a high priority of the rail industry and government

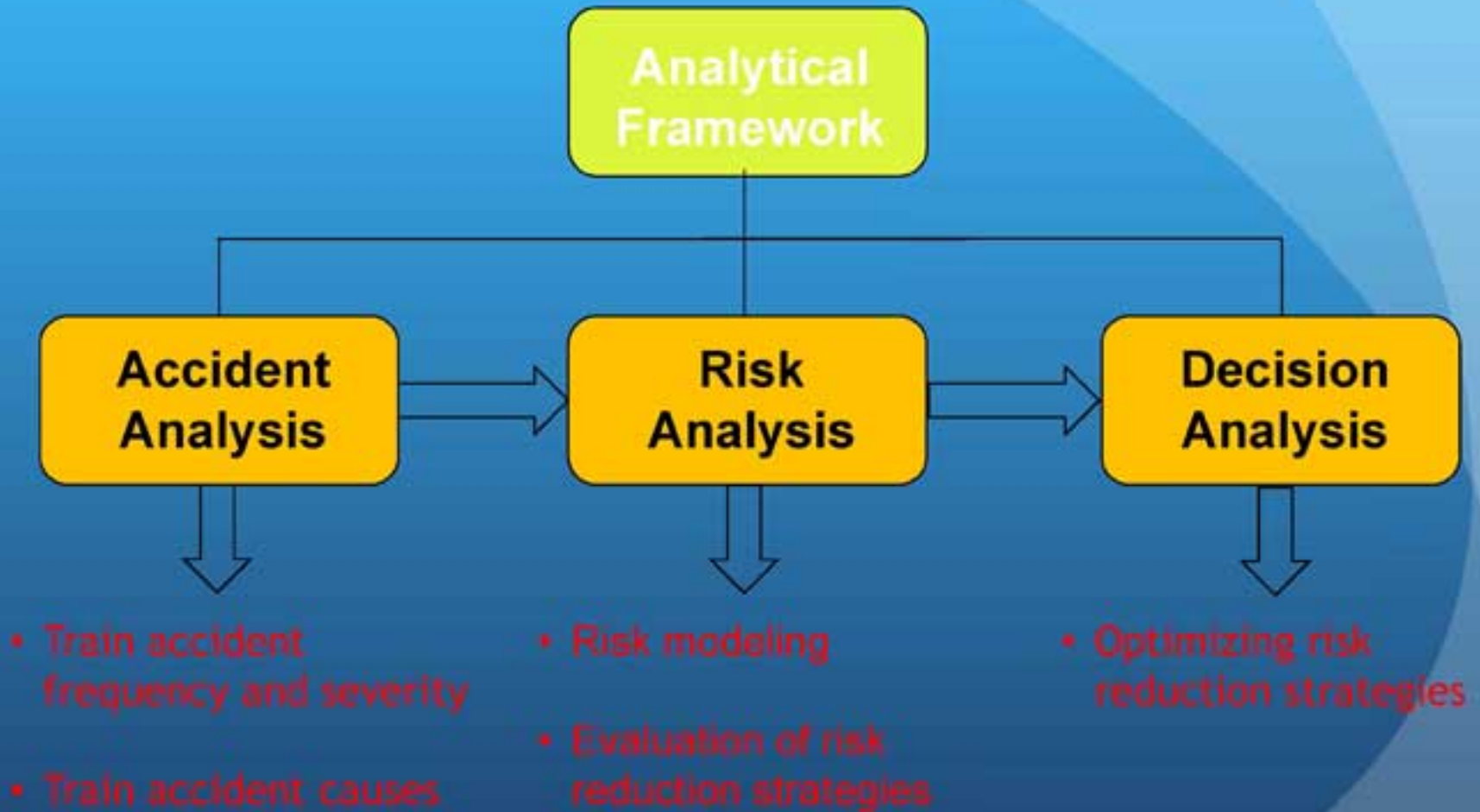
Influence diagram showing relationships of factors affecting hazardous materials transportation safety



Railroad hazardous materials transportation risk management framework



Analytical models for risk management



Analytical models for risk management

Analytical Framework



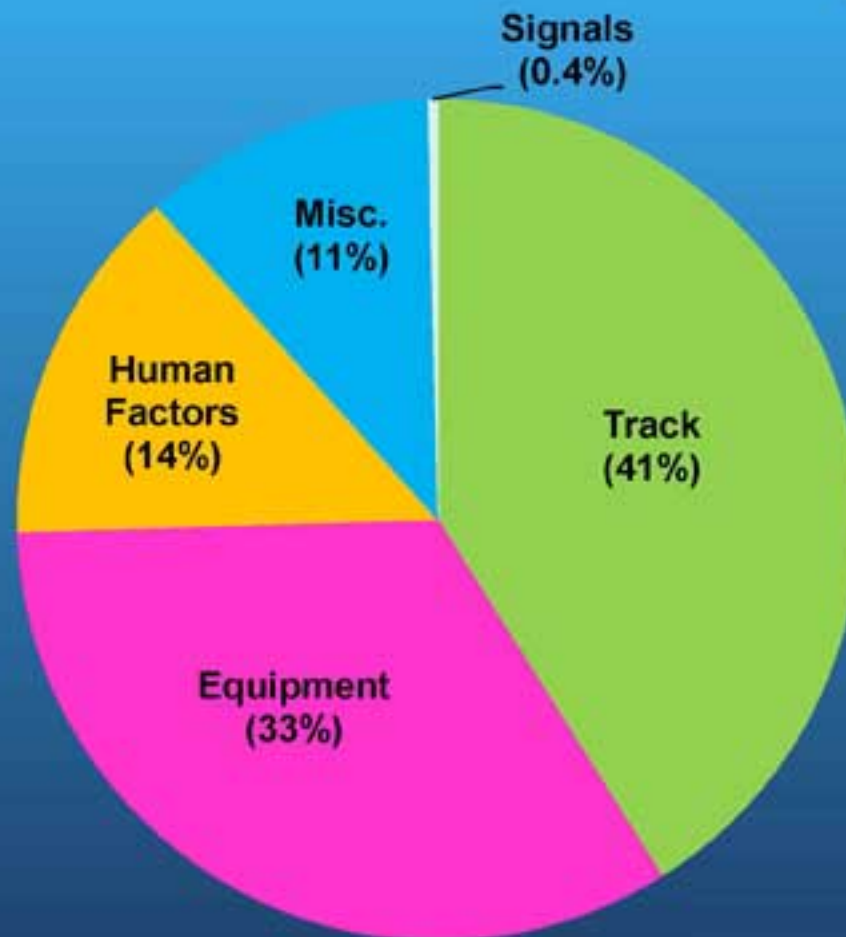
- Train accident frequency and severity

- Train accident causes

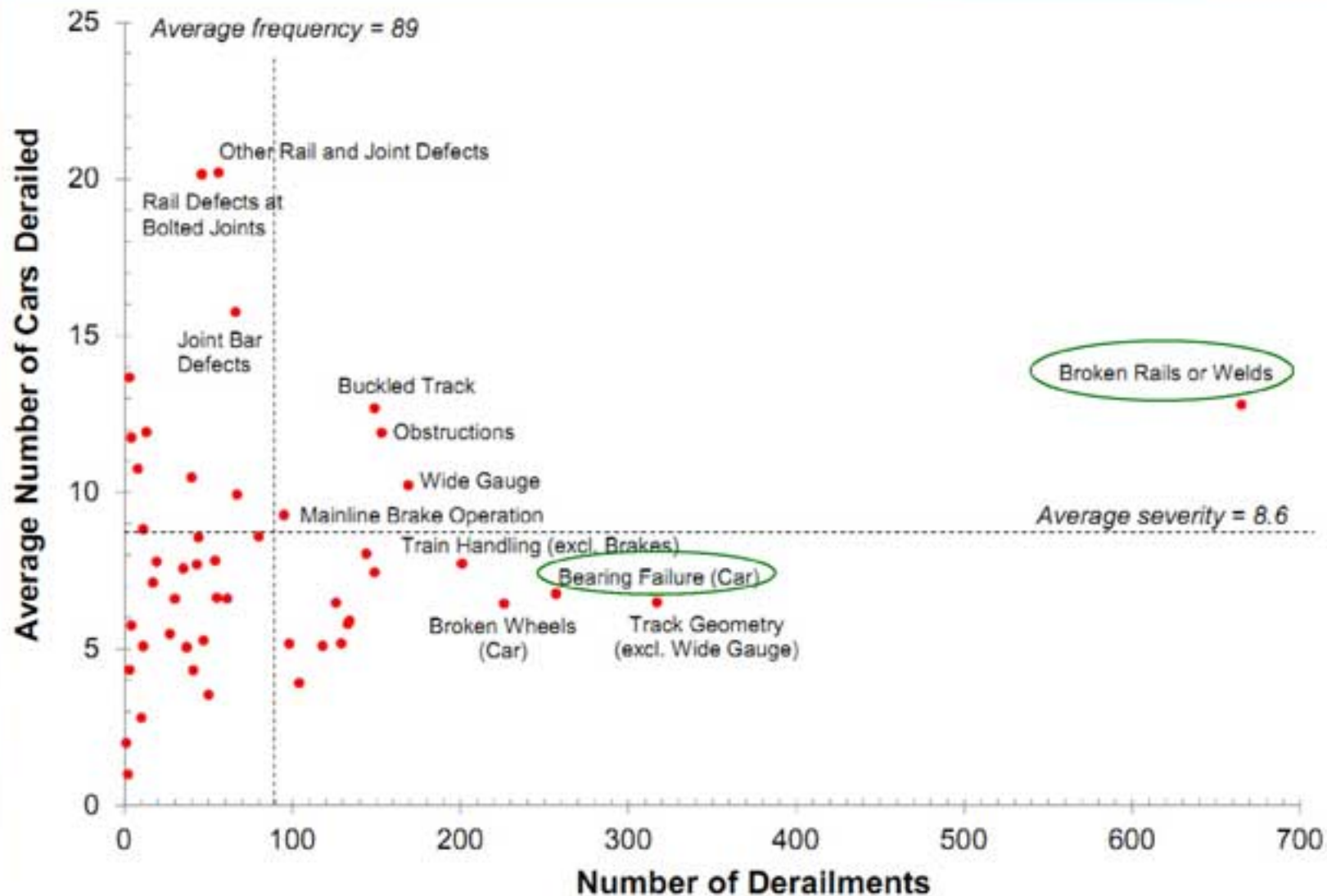
- Risk modeling
- Evaluation of risk reduction strategies

- Optimizing a combination of risk reduction strategies

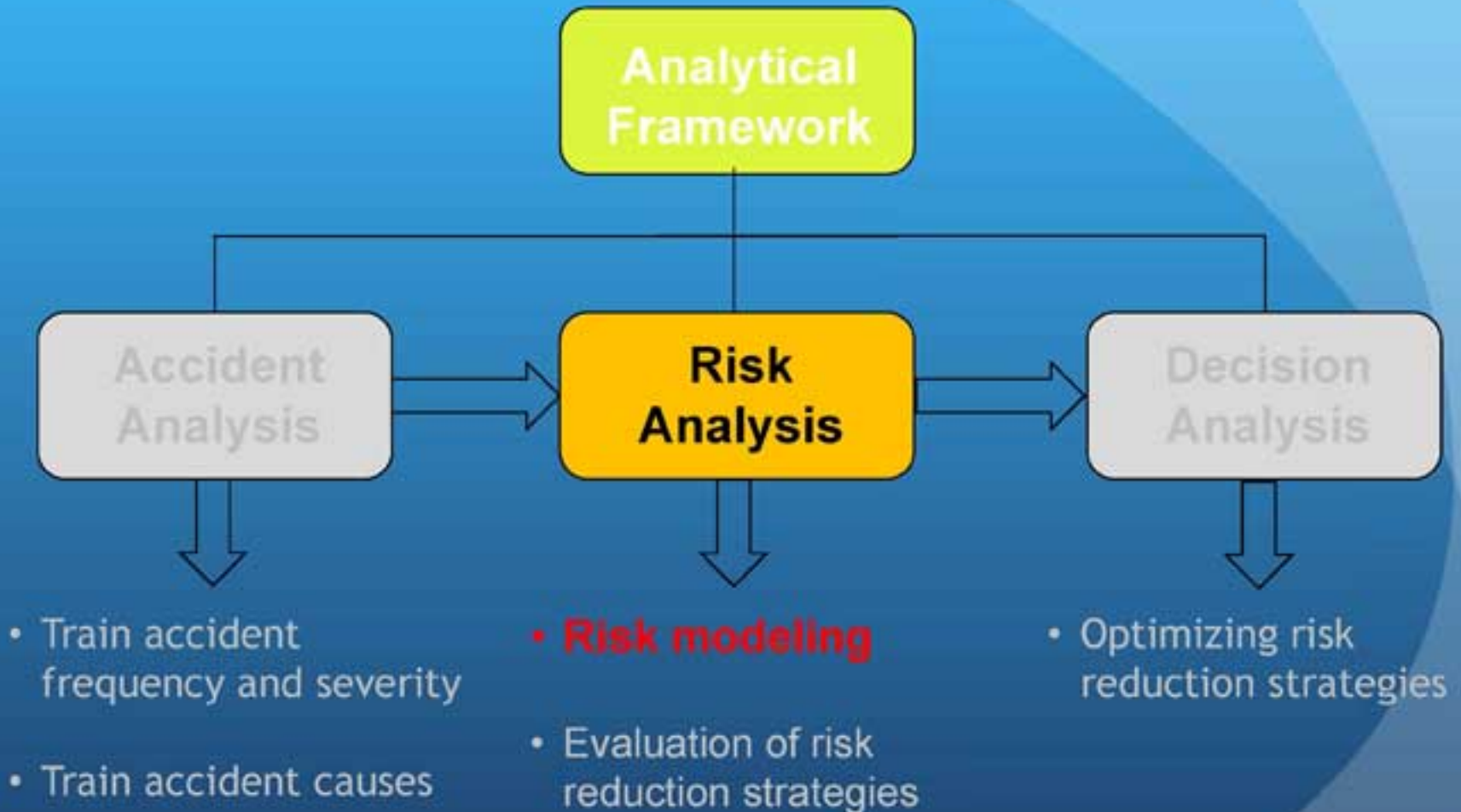
Freight-train derailments on Class I mainlines by accident cause group: 2001-2010



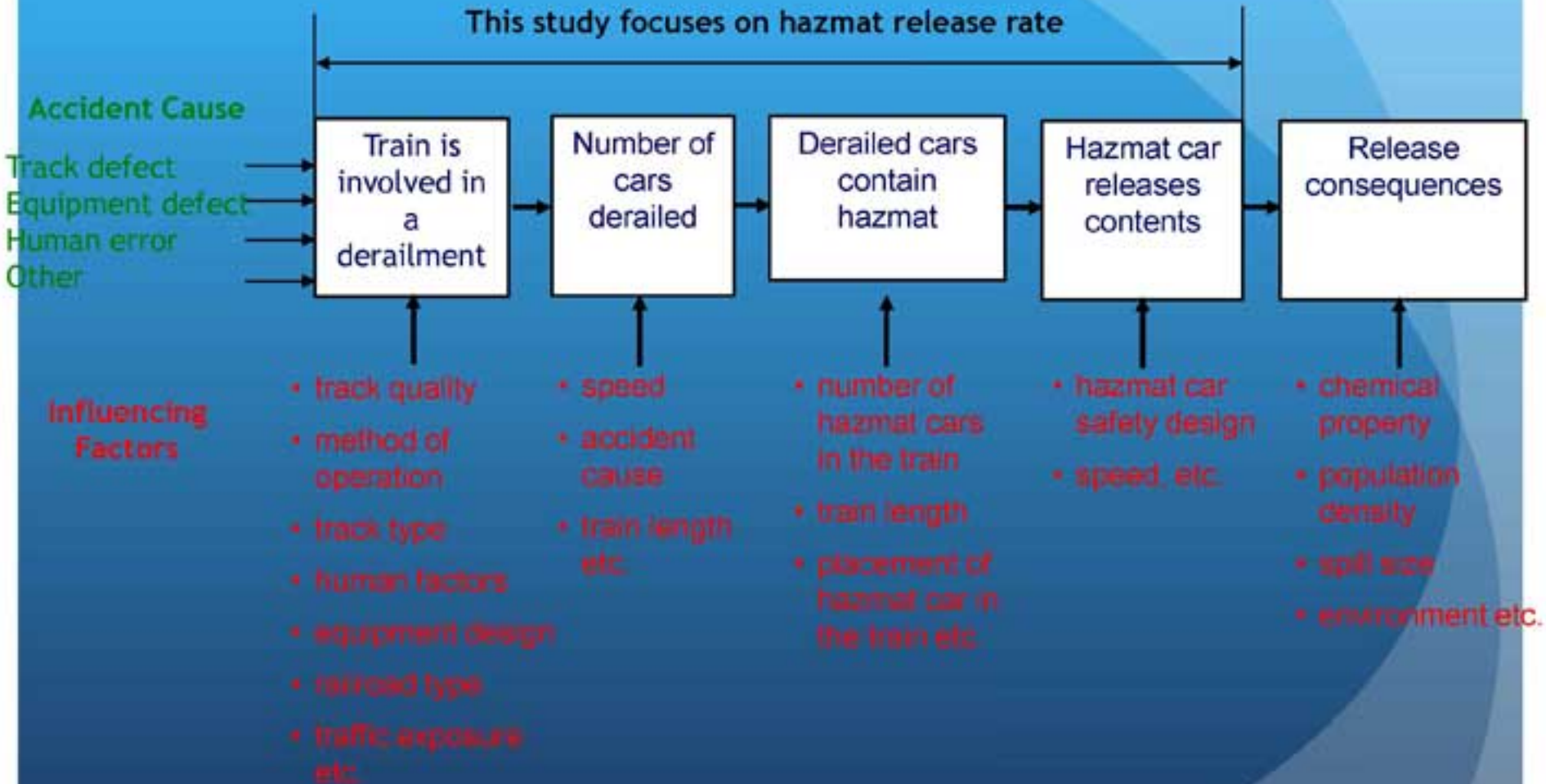
Frequency-severity graph of Class I mainline freight-train derailments, 2001-2010



Analytical models for risk management



Chain of events leading to hazmat car release



Modeling hazmat car release rate

$$P(R) = P(A) \times \left\{ \sum_{i=1}^L P(D_i | A) \times \left\{ \sum_{j=1}^J [P(H_{ij} | D_i, A) \times P(R_{ij} | H_{ij}, D_i, A)] \right\} \right\}$$

Where:

$P(R)$ = release rate (number of hazmat cars released per train-mile, car-mile or gross ton-miles)

$P(A)$ = derailment rate (number of derailments per train-mile, car-mile or gross ton-mile)

$P(D_i | A)$ = conditional probability of derailment for a car in i^{th} position of a train

$P(H_{ij} | D_i, A)$ = conditional probability that the derailed i^{th} car is a type j hazmat car

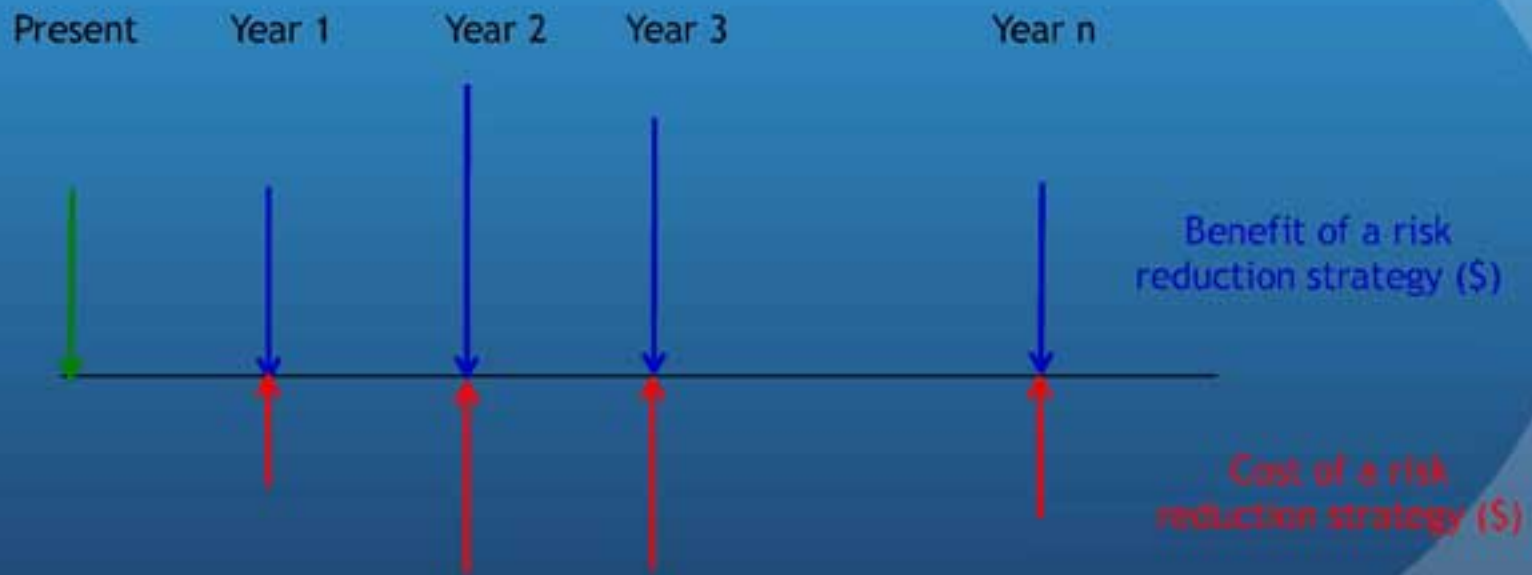
$P(R_{ij} | H_{ij}, D_i, A)$ = conditional probability that the derailed type j hazmat car in i^{th} position of a train released

L = train length

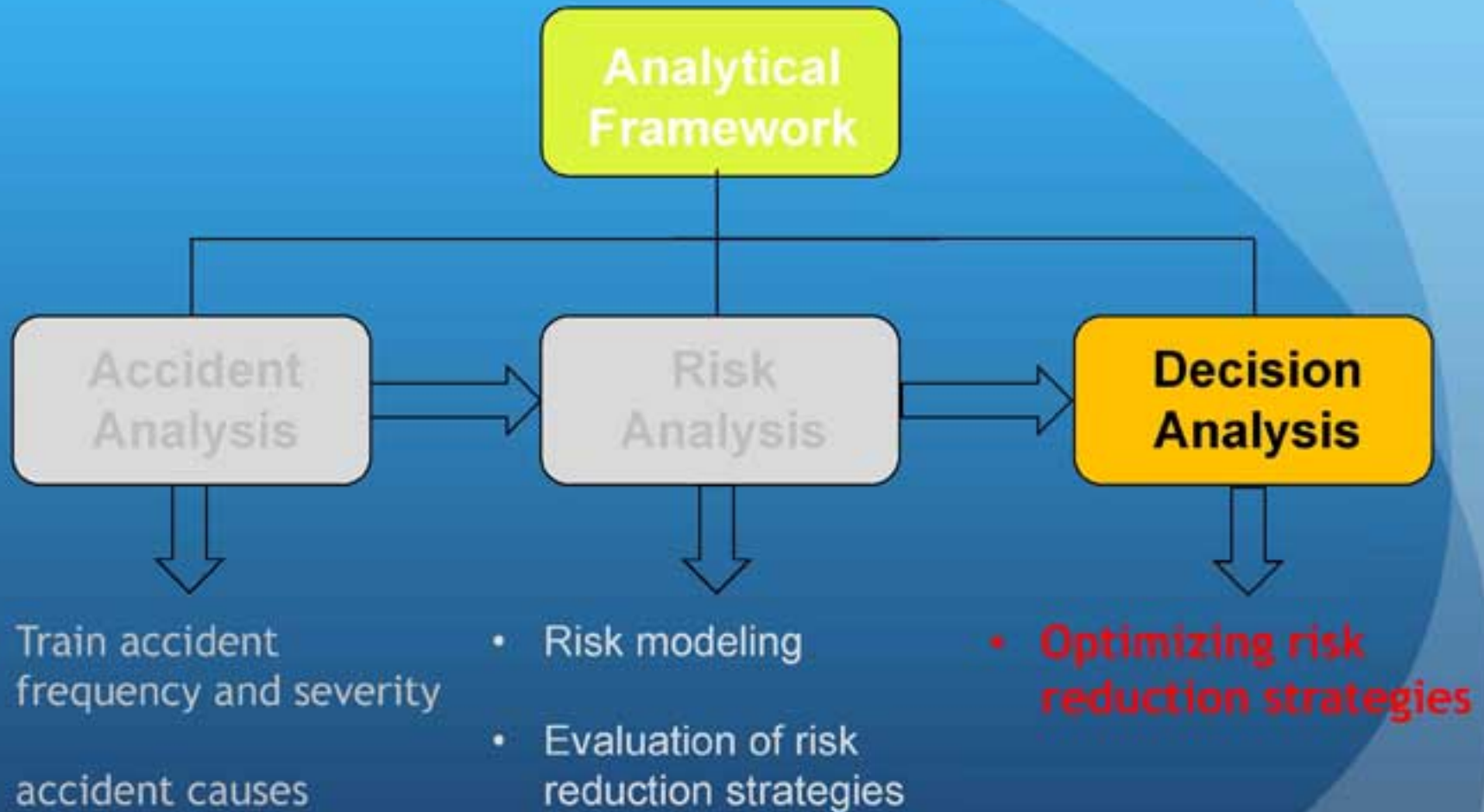
J = type of hazmat car

Net present value (NPV) approach to evaluate risk reduction strategies

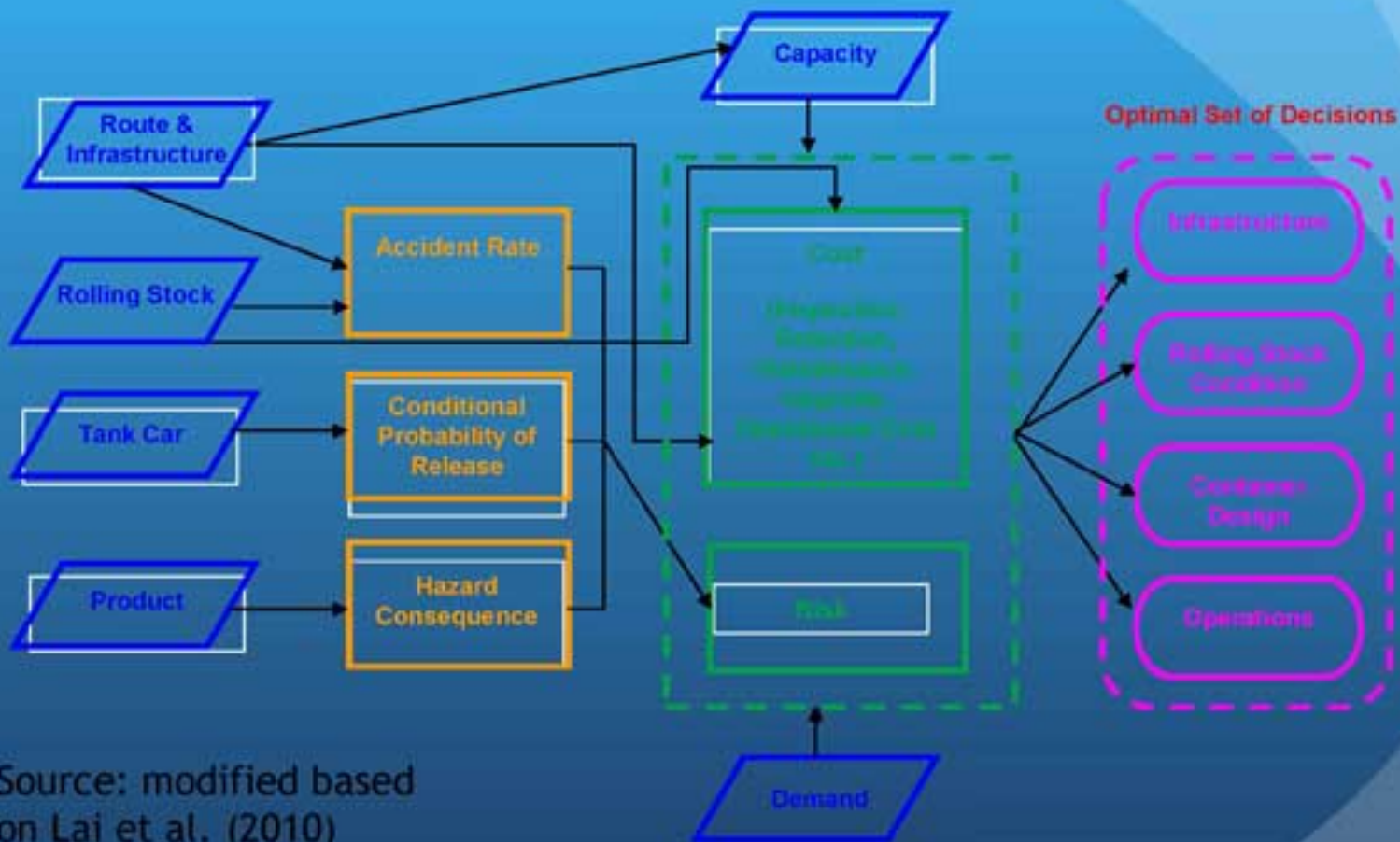
$$NPV = \sum_{t=0}^T \frac{B_t - C_t}{(1 + A)^t}$$



Analytical models for risk management



An example model to manage the risk of transporting hazardous materials on railroad networks



Source: modified based on Lai et al. (2010)

Example integrated optimization model

Model Formulation

$$\min \underbrace{\sum_{(i,j) \in A} \sum_{v \in V} \sum_{q \in Q} H_{ij}^{vq} y_{ij}^{vq}}_{\text{Maintenance cost}} + \underbrace{\sum_{(i,j) \in A} \sum_{k \in K} \sum_{t \in T} C_{ij} x_{ij}^{kt}}_{\text{Transportation cost}} + \underbrace{\sum_{(i,j) \in A} \sum_{v \in V} \sum_{q \in Q} R_{ij}^{vq} y_{ij}^{vq}}_{\text{Risk cost}}$$

Subject to:

$$\left. \begin{aligned} \sum_{k \in K} \sum_{t \in T} (x_{ij}^{kt} + x_{ji}^{kt}) &\leq \sum_{v \in V} \sum_{q \in Q} U_{ij}^{vq} y_{ij}^{vq} & \forall (i,j) \in A, (i < j) & \text{Capacity constraint} \\ \sum_{v \in V} \sum_{q \in Q} y_{ij}^{vq} &= 1 & \forall (i,j) \in A, (i < j) & \text{Track class and car} \\ & & & \text{composition constraint} \\ \sum_{k \in K} (x_{ij}^{kt} + x_{ji}^{kt}) &\leq \sum_{v \in V} \sum_{q \in Q} N_t^v y_{ij}^{vq} & \forall (i,j) \in A, (i < j), t \in T & \text{Linking constraint} \\ & & & \text{for decision variables} \\ \sum_{j \in \mathcal{D}^+(i)} x_{ij}^{kt} - \sum_{j \in \mathcal{D}^-(i)} x_{ji}^{kt} &= \begin{cases} D_{kt} z_{kt} & \text{if } i \in s_{kt} \\ -D_{kt} z_{kt} & \text{if } i \in e_{kt} \\ 0 & \text{otherwise} \end{cases} & \forall i \in N, k \in K, t \in T & \text{Flow conservation} \\ & & & \text{constraint} \\ \sum_{t \in T} z_{kt} &= 1 & \forall k \in K & \text{Car type constraint} \\ x_{ij}^{kt} &\in \text{positive integer}, & \forall (i,j) \in A, k \in K, t \in T, & \text{Decision Variables} \\ y_{ij}^{vq} &\in \{0,1\}, & \forall (i,j) \in A, v \in V, q \in Q, & \text{Constraint} \\ z_{kt} &\in \{0,1\}, & \forall k \in K, t \in T & \end{aligned} \right\}$$

Passenger Rail and Urban Transit in Canada

- Canadian urban transit systems:
 - **1.5 billion** passenger trips per year
 - **4 million** passenger trips per day
- Canadian airports -- **78.7 million** passenger trips per year
- Systems & cities depend on moving passengers quickly, conveniently and inexpensively
- Passenger rail and urban transit systems include:
 - Commuter rail
 - Light Rail Transit
 - Subways
 - Municipal bus systems
 - Intercity passenger rail and bus

Many Partners

- Public & Users
- Operators & Transportation Workes
- Key Associations such as Railway Association of Canada, and Canadian Urban Transportation Association
- Railway companies; provide federally regulated tracks for most intercity and commuter rail systems; majors (CN,CP) have own police
- Municipal/provincial governments - provide operating funding, legislative and other authorities; provincial emergency preparedness responsibility / authority, policing, and first responders
- Public Safety Portfolio - responsible for national emergency management, law enforcement and national security
- Transport Canada - lead for national transportation security; regulatory authority for rail security under *Railway Safety Act*

International Consensus

- International meeting of Ministers of Transportation in Japan (January 2006) consensus on future security directions:
 - Sharing of best practices
 - Promoting international cooperation on specialized R&D
 - Encouraging cooperation among government authorities, operators, and all relevant stakeholders
 - Considering creation of international working group to facilitate sharing of best practices and enhance global cooperation
- G8 leaders outlined a counter-terrorist strategy in July 2005

United States Actions

- Rail and urban transit security is one of Department of Homeland Security's top three priorities in 2006
- Key accomplishments:
 - 2006 \$2.5B in general grants and \$160M targeted to rail, inter-city and transit security
 - Inter-agency anti-terrorism training program
 - Surface Transportation Security Inspector Program
 - Vulnerability assessments of rail and transit networks in high-density urban areas
 - New explosives detection canine teams

Other Country's Approaches

Australia

- Australian Government and all state and territory governments established National Transport Security Strategy and signed Intergovernmental Agreement to guide land transport security priorities in 2005:

France

- New police force dedicated to rail security established January 2006

United Kingdom

- Department of Transport regulates counter-terrorist security on national rail network, London Underground and Channel Tunnel, and for security of dangerous goods in transit (mainly under Railway Act)
- Network Rail and Train Operating Companies responsible for delivery of security; strong partnership between London Underground and British Transport Police

Lessons Learned from U.K. Attack

- Clear focus on Business Resumption
- Clear roles and responsibilities established
- Importance of employee training to work in concert with emergency response
- Early communication with personnel and the public
- Video surveillance critical for investigation



Rail and Urban Transit Security in Canada

Legislation

- Transport Canada authorities under *Railway Safety Act*
- Covers federally regulated railways (VIA, CN, CP etc.) or provincial railways operating on tracks under federal authority
- No federal security regulations promulgated to date
- Urban transit generally under provincial / municipal jurisdiction (e.g. STM, SkyTrain, TTC, etc.)

MOU signed between TC and Railway Association of Canada on Railway Security

TC Rail & Transit Security

Post-Madrid - 2004

- TC expanded its security information-sharing network with major rail and transit operators
- Rail Security Policy Review expanded to include major Urban Transit
- Discussion paper and consultations with industry and associations anticipated Spring 2006
- Threat and Risk assessment (TRA) completed
- Information network activated immediately after London bombings

Post-London - 2005

- Threat and Risk Assessment re-validated
- November 2005, the government announced a \$110M Immediate Action Plan to accelerate security enhancements, awaiting new government direction

Public Transit & Inter-city Bus Working Group

- Draft Security Overview Paper on Public Transit & Inter-city Bus: Completed

- Overview of issue/sector
- Analysis & take stock of current situation
- Identify Vulnerabilities & Threats
- Propose Actions & Strategies



Some Suggested Rail & Transit Priorities

- Regular transit Emergency Planning exercises
- Promote recovery plans
- Increase local inter-agency communications
- Increase information sharing
- Develop federal-provincial/territorial protocols
- Promote research into new technology
- Develop Security Management Systems and Best Practices
- New risk assessment tools

RAILHEAD OPERATIONS TRAINING

History:

“Rail is often the preferred mode of transport because it is less expensive and faster than other means for moving large forces.”

General Omar Bradley
1959



The 4 Phases of Railhead Operations



Investment Models

- **Dynamic models**
 - Directional, responsive and designed to quickly generate meaningful discussions and courses of action
- **Probability based**
 - Our models include statistical price action and probability analysis
- **Matrix of Models**
 - We have created a matrix of connected models that analyzes the inter-market relationship

Total Projected Cumulative Infrastructure Spending 2005-2030: \$41 Trillion



Water
\$22.6T

Power
\$9.0T

Road and Rail
\$7.8T

Air/Seaports
\$1.6T

Source: Booz Allen Hamilton, Global Infrastructure Partners, World Energy Outlook, Organisation for Economic Co-operation and Development (OECD), Boeing, Drewry Shipping Consultants, U.S. Department of Transportation

Thanks