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Wilson: I HAVE A LOT OF FAITH IN THE GOOD SENSE OF HUMAN BEINGS AND THEIR DESIRE NOT TO DESTROY THE WORLD. A LOT OF MORAL INEPTITUDE, IT SHOULD BE REMEMBERED IS DUE TO POOR PLANNING RATHER THAN INNATE WICKEDNESS. I THINK PEOPLE ARE INNATELY GOOD BUT THEY TEND TO BE TERRIBLE PLANNERS SO THEY GET THEMSELVES INTO SITUATIONS, THEN WHEN THEY DO BAD THINGS. AND I BELIEVE THAT'S THE SITUATION WE'RE IN RIGHT NOW IN THE ENVIRONMENT. PEOPLE AROUND THE WORLD ARE NOW GENERALLY AWARE OF IMPORTANT ENVIRONMENTAL CHANGES, LED BY CLIMATE CHANGE. THEY ARE AWARE THAT SPECIES ARE GOING EXTINCT AND THEY UNDERSTAND THAT IT'S

NOT A GOOD THING  
IF WE DESTROY THE  
RAINFORESTS AND CORAL REEFS.  
IN FACT, IT'S A VERY BAD AND  
DANGEROUS THING.  
AND THIS RISING AWARENESS  
I THINK, CAN BE READ AS A  
TREND, WHICH IS A SOURCE OF  
OPTIMISM.  
THE QUESTION IS -- WILL WE  
WAKE UP?  
WILL WE REACH A TIPPING POINT?  
AND I HOPE THERE WILL BE A  
TIPPING POINT  
WHERE THIS BECOMES PART OF  
THE GLOBAL ETHIC  
IN TIME TO AVOID REAL  
CATASTROPHE  
IN TERMS OF CLIMATE CHANGE  
THAT'LL AFFECT ALL OF US  
AND, IN TERMS OF MASS  
DESTRUCTION  
POSSIBLY UP TO HALF THE  
SPECIES ON EARTH  
SAY, BY THE END OF THE  
PRESENT CENTURY.

Narrator: RISING HUMAN  
POPULATION  
BIODIVERSITY LOSS  
AND CLIMATE CHANGE ARE  
ISSUES OF PRIMARY

ENVIRONMENTAL CONCERN  
NOT ONLY FOR OUR  
DESCENDENTS  
BUT FOR ALL THE SPECIES THAT  
CALL THIS THE HABITABLE  
PLANET.

WHEN ENVIRONMENTAL  
SCIENTISTS LOOK INTO THE  
FUTURE

WILL HUMAN ACTIONS  
OVERWHELM ENVIRONMENTAL  
SYSTEMS

OR WILL WE WORK TOGETHER TO  
ASSURE A STABLE  
ENVIRONMENT?

Schrag: THERE'S STILL SO MUCH  
ABOUT THE EARTH SYSTEM  
THAT WE DON'T UNDERSTAND  
WHETHER IT'S ABOUT OCEANS OR  
ABOUT THE CLIMATE SYSTEM  
OR ABOUT ECOSYSTEMS AND  
BIOLOGY.

THERE'S STILL SO MANY  
MYSTERIES LEFT TO UNCOVER.  
OUR IMPACTS ON THE EARTH ARE  
SO HUGE

IN MANY WAYS, IT'S AN  
EXPERIMENT WE'RE DOING ON  
THE PLANET.

IT'S AN EXPERIMENT BECAUSE IT'S  
NEVER BEEN DONE BEFORE  
AND NO ONE UNDERSTANDS THE

EARTH WELL ENOUGH  
TO PREDICT EXACTLY WHAT'S  
GONNA HAPPEN.  
WE'RE GONNA FIND OUT OVER  
THE NEXT CENTURY  
WHAT THIS EXPERIMENT YIELDS  
AND WHETHER OUR ACTIONS WILL  
ALLOW THE EARTH TO  
PERSEVERE  
IN A STATE THAT ALLOWS LIFE TO  
FLOURISH  
OR WHETHER HUMAN ACTIVITIES  
WILL REALLY CAUSE  
A CATASTROPHE OF SOME SORT.  
WE'RE AFFECTING THE SPECIES  
WE SHARE THE EARTH WITH  
THROUGH THE WAY WE USE LAND  
BY BUILDING CITIES AND ROADS,  
CUTTING DOWN FORESTS.  
WE'RE AFFECTING THE WATER WE  
DRINK  
BY CHEMICALS THAT WE ARE  
SPILLING ON THE GROUND.  
WE AFFECT THE AIR WE BREATHE,  
AND MOST IMPORTANTLY  
WE'RE AFFECTING THE  
CLIMATE ALL AROUND US.  
BUT UNDERNEATH ALL OF THESE  
IS THE BASIC FACT  
THAT THERE ARE MORE HUMANS  
TODAY THAN EVER BEFORE  
AND THAT NUMBER IS GROWING

YEAR BY YEAR.

Bloom: IT TOOK THE HUMAN RACE  
99% OF ITS HISTORY  
TO REACH 1 BILLION PEOPLE.  
IT REACHED 1 BILLION PEOPLE  
AROUND THE YEAR 1800  
AND NOW WE'RE ADDING  
ANOTHER BILLION EVERY 12 TO 15  
YEARS.

SO, IN 1960, WORLD POPULATION  
STOOD AT ABOUT 3 BILLION.  
IT CROSSED THE 6-BILLION MARK  
BY THE YEAR 2000.

IT'S NOW OVER 6.5 BILLION.  
IT LOOKS LIKE GLOBAL  
POPULATION WILL STABILIZE  
IN THE 9- TO 10-BILLION RANGE  
WITHIN THE NEXT 50 TO 100  
YEARS.

THAT IS AN EXTRAORDINARY  
CHALLENGE --  
THE CHALLENGE OF ABSORBING  
BETWEEN 2.5 AND 4 BILLION  
ADDITIONAL PEOPLE  
ONTO THE PLANET  
AND HAVING THE RESOURCES TO  
FEED THEM  
AND TO CLOTHE THEM AND TO  
HOUSE THEM  
AND TO EDUCATE THEM AND TO  
PROVIDE FOR THEIR MEDICAL

CARE.  
THE CAPACITY OF THE  
ENVIRONMENT TO ASSIMILATE  
AIR, WATER  
AND LAND POLLUTION IS MUCH  
MORE STRAINED  
SO THE CAPACITY OF THE  
ENVIRONMENT  
TO BASICALLY ASSIMILATE AND  
RECYCLE WASTE  
IS MUCH MORE LIKELY TO BE  
EXCEEDED.  
AND BY ANY MEASURE  
THAT CHALLENGE HAS EARNED  
THE NAME "THE POPULATION  
PROBLEM."

Narrator: OF ALL FUTURE HUMAN  
IMPACTS ON THE PLANET  
POPULATION GROWTH IS ONE OF  
THE MOST IMPORTANT  
VARIABLES.

CONSERVATIVE ESTIMATES OF  
WORLD POPULATION GROWTH  
SUGGEST THAT OUR SPECIES  
WILL DEMAND 50% MORE GOODS  
AND SERVICES  
THAN ARE CURRENTLY  
PRODUCED WORLDWIDE.  
BUT THAT ASSUMES  
CONSUMPTION RATES AROUND  
THE WORLD  
WILL REMAIN THE SAME AS THEY

ARE TODAY, WHICH ISN'T THE  
CASE.

Schrag: THE POPULATION  
PROBLEM ISN'T JUST THE  
NUMBER OF PEOPLE  
BUT ALSO WHAT THOSE PEOPLE  
DO.

OVER THE NEXT CENTURY  
OUR POPULATION MAY GROW TO 9  
OR 10 BILLION.

BUT MORE THAN THAT, PEOPLE  
ARE GETTING RICHER.

THEY'RE USING MORE THINGS,  
MORE ENERGY, MORE NATURAL  
RESOURCES

AND THIS IS PUTTING HUGE  
STRESS ON THE EARTH SYSTEM.

Narrator: WORLD GDP ROSE  
SLOWLY UNTIL THE INDUSTRIAL  
REVOLUTION.

AROUND 1800, GLOBAL ECONOMIC  
OUTPUT

BEGAN TO GROW FASTER AND  
FASTER

LEADING TO DRAMATIC IMPACTS  
ON THE ENVIRONMENT.

Schrag: WHEN PEOPLE ARE POOR  
AND THEY EAT A DIET MOSTLY OF  
GRAINS

THEY NEED THE WATER  
REQUIRED TO GROW THAT GRAIN  
AND THE LAND REQUIRED TO

GROW THAT GRAIN.  
IF PEOPLE GET A LITTLE BIT  
RICHER  
AND THEY START TO EAT MEAT  
THEY START TO HAVE A COW,  
MAYBE A FEW GOATS.  
NOW THEY NEED NOT ONLY THE  
GRAIN THAT THEY WOULD EAT  
BUT ALSO THE GRAIN TO FEED  
THESE ANIMALS.

Narrator: HIGHER-INCOME  
COUNTRIES REQUIRE MORE LAND  
AREA  
TO SUPPORT EACH PERSON THAN  
POOR COUNTRIES.  
AS INCOMES RISE  
EACH PERSON'S FOOTPRINT  
INCREASES AS WELL.

Schrag: AND WHEN THEY USE  
MORE LAND  
THEIR FOOTPRINT ON THE  
NATURAL WORLD  
BECOMES GREATER AND  
GREATER, PUSHING NATURAL  
BIODIVERSITY  
TO EXIST IN A SMALLER AND  
SMALLER SPACE  
AND THREATENING NATURAL  
ECOSYSTEMS.

Narrator: IN THE NEXT CENTURY,



THE INCREASED POPULATION  
WILL DEMAND EVEN MORE  
FROM THE WORLD'S DIMINISHING  
NATURAL ECOSYSTEMS.

THE TROPICAL RAINFOREST IS  
ONE DRAMATIC EXAMPLE.

HUMAN NEEDS FOR WOOD AND  
OTHER NATURAL RESOURCES  
FUELED THE DESTRUCTION OF  
MUCH OF THE RAINFOREST.

FROM 1950 TO THE PRESENT,  
RAINFORESTS SHRANK  
FROM 14% OF THE PLANET'S LAND  
AREA TO ONLY 6%.

IF THIS RATE OF DECLINE  
CONTINUES

THERE WILL BE NO RAINFOREST  
BY THE END OF THE CENTURY.

Schrag: AND SO, THERE REMAIN  
MANY PARTS OF THE TROPICS  
WHERE HUGE AREAS OF  
BIODIVERSITY STILL EXIST  
AND YET, THAT'S CHANGING  
MORE AND MORE.

IN THE AMAZON, AS WE'VE CUT  
DOWN FORESTS TO GROW  
SOYBEANS

IN INDONESIA, AS WE CUT DOWN  
FORESTS FOR TIMBER

AND FOR PALM PLANTATIONS  
WHAT WE'RE SEEING IS NATURAL  
ECOSYSTEMS ARE THREATENED

BY HUMAN LAND-USE CHANGES.  
I WOULD ARGUE VERY  
GENERALLY  
WE SHOULD CARE ABOUT THE  
HEALTH OF ANY ECOSYSTEM --  
YEA, EVEN THE VERY SPARSE  
ECOSYSTEMS OF DESERTS  
OR PARTS OF THE ARCTIC.  
BUT I THINK WE NEED TO PAY A  
SPECIAL ATTENTION  
TO THE TROPICAL FOREST  
BECAUSE THAT'S WHERE MOST  
OF THE DIVERSITY OF LIFE IS ON  
EARTH  
AT THE SPECIES LEVEL.  
FOR HEAVEN'S SAKE, WE'RE  
TALKING ABOUT MOST OF THE  
CREATION.  
DO WE REALLY WANT TO SEE  
THESE FORESTS CONTINUE TO BE  
DESTROYED?  
THE SPECIES THAT ARE IN THEM  
ARE OFTEN MILLIONS OF YEARS  
OLD  
AND THEY'VE TAKEN  
JUST ALMOST UNIMAGINABLY  
LONG PERIODS OF TIME TO  
EVOLVE  
TO BE ADAPTED TO ONE ANOTHER  
AND TO CREATE UNIQUE GENETIC  
COMBINATIONS  
AND UNIQUE PHYSIOLOGY AND

UNIQUE LIFE CYCLE.  
EVERY TIME WE ALLOW ONE  
SPECIES TO GO EXTINCT  
WE'RE ERASING A MILLION YEARS  
OR SO OF GENETIC EVOLUTION  
AND THE UNIQUE PRODUCTS OF  
THAT EVOLUTION.  
WE'RE LOSING IT OFTEN WITHOUT  
EVEN KNOWING IT WAS EVER  
THERE.

Dr. Laurence: THERE'S LOTS OF  
REASONS TO CARE ABOUT  
TROPICAL FORESTS.  
OBVIOUSLY THEY'RE THE  
GREATEST BASTIONS OF  
BIOLOGICAL DIVERSITY  
ANYWHERE ON THE PLANET  
AND OF COURSE, THEY'RE  
PRODUCING MASSIVE AMOUNTS  
OF OXYGEN  
WHICH HELP TO KEEP OUR  
WHOLE BIOSPHERE SURVIVABLE.  
THEY ALSO STORE A HUGE  
AMOUNT OF CARBON IN THE  
VEGETATION.  
AND SO, WHEN THOSE FORESTS  
ARE SLASHED AND BURNED  
MOST OF THAT CARBON IS GOING  
UP INTO THE ATMOSPHERE  
AND CARBON DIOXIDE AND  
METHANE  
AND OTHER KINDS OF

GREENHOUSE GASES, OF  
COURSE  
WHICH IS THE REASON THAT WE  
HAVE THE GREENHOUSE EFFECT.  
SO, MAYBE A QUARTER OF ALL  
THE GREENHOUSE GASES  
THAT ARE BEING PRODUCED BY  
HUMANITY RIGHT NOW  
ARE OCCURRING AS A  
CONSEQUENCE OF THE RAPID  
SLASHING  
AND BURNING AND RAZING OF  
TROPICAL FORESTS.  
SO, I THINK THAT WE'VE REALLY  
GOT OUR WORK CUT OUT FOR US.  
THERE'S BEEN SOME SUCCESSES

--

SOME NEW PARKS AND  
RESERVES THAT HAVE BEEN  
DESIGNATED  
BUT I THINK WE HAVE TO BE VERY  
VIGILANT.  
RIGHT NOW, I FEEL LIKE WE'RE  
SORT OF LIKE  
WE'VE GOT OUR FINGERS IN THE  
DIKE  
AND, REALLY, WE'RE TRYING TO  
STAVE OFF  
A POTENTIALLY CATASTROPHIC  
FLOOD OF EXTINCTIONS.

Pringle: WHEN YOU TALK ABOUT

CONSERVATION OR  
PRESERVATION  
TREES ARE IN SOME SENSE  
PERHAPS JUST THE EASY  
BENCHMARKS  
THAT WE CAN REACH FOR --  
WE'VE SAVED THIS MANY TREES.  
BUT WHEN I THINK ABOUT  
CONSERVATION  
I DO THINK ABOUT, OKAY, WE MAY  
HAVE SAVED THAT MANY TREES  
BUT HOW MANY FUNGI HAVE WE  
SAVED UNDERNEATH THE TREES?  
FOR EVERY TREE THAT YOU'VE  
SAVED  
YOU'VE SAVED 10 SPECIES OF  
FUNGI, 15, 20?  
WE DON'T KNOW.  
PRESERVING BIODIVERSITY ISN'T  
A PROBLEM  
THAT BELONGS ONLY TO THE  
PEOPLE OF THE TROPICS.  
THE TRUTH IS THAT EVEN IF  
YOU'VE PRESERVED  
ALL THE BIODIVERSITY IN THE  
TROPICS  
AND YOU TORE DOWN  
EVERYTHING IN NORTH AMERICA  
IT WOULDN'T BE A VERY FUN  
PLACE TO LIVE.  
SO YOU NEED TO PAY ATTENTION  
TO YOUR LOCAL BIODIVERSITY

AS WELL AS THE BIODIVERSITY  
THAT EXISTS ELSEWHERE.  
AND IT'S VERY HARD TO PREDICT  
WHAT COMPONENTS OF  
BIODIVERSITY YOU CAN LOSE OR  
NOT LOSE  
AND STILL HAVE A STABLE  
ECOSYSTEM.  
YOU CAN ARGUE THAT ONE OR  
TWO SPECIES BEING LOST  
WILL HAVE NO GREAT IMPACT ON  
THE ECOSYSTEM  
BUT THAT'S NOT WHAT'S  
HAPPENING.  
WE'RE LOSING DOZENS OR  
HUNDREDS OF SPECIES AT A  
TIME.  
AND ALTHOUGH IT'S VERY  
DIFFICULT FOR US TO  
UNDERSTAND  
THE SERVICES THAT  
ECOSYSTEMS PROVIDE TO US  
BECAUSE THEY HAVE NO  
TRADITIONAL ECONOMIC VALUE  
THEY DO, IN FACT, PROVIDE US  
WITH A TREMENDOUS WEALTH OF  
GOODS AND SERVICES  
AND IT MAY BE TIME FOR US  
TO START THINKING ABOUT  
THOSE SERVICES AND  
PROTECTING THEM  
NOT ONLY FOR OURSELVES BUT

FOR OUR GRANDCHILDREN, AS  
WELL.

Narrator: USING THE UNITED  
STATES AS AN EXAMPLE  
NEW WILDERNESS AREAS ON  
LAND CONTINUE TO BE SET ASIDE.

BUT THE OCEAN, WHICH COVERS  
75% OF THE PLANET  
HAS EVEN LESS TOTAL  
PROTECTED AREA THAN THE  
LAND.

Pauly: ON LAND, WE PROTECT  
ABOUT 10% TO 15%.  
MOST COUNTRIES PROTECT 10%  
TO 15% OF THE FOREST  
OF THE WILD LAND  
AND IN THE WATER, WE DON'T  
PROTECT ANYTHING, REALLY.  
THAT IS REALLY AN IMPORTANT  
THING --  
THAT WE DON'T PROTECT ANY  
WATER AREA.  
SO, PUT DIFFERENTLY  
WE CAN FISH ON 99.4% OF THE  
OCEAN.  
SO, THE IDEA OF PROTECTING  
FISH  
IS COUNTER TO OUR DEEPEST  
FEELING  
BUT WE MUST PROTECT FISH IF

WE WANT TO HAVE THEM.  
THERE SEEMS TO BE A TENDENCY  
WHEN WE THROW OUR  
INDUSTRIAL MIGHT AT A FISH  
SPECIES  
TO DEplete IT  
AND IT HAPPENS EVERYWHERE  
YOU LOOK.  
SO, THERE ARE LOTS OF EXTINCT  
FISHERIES  
THAT PEOPLE ARE NOT AWARE OF  
--

FOR EXAMPLE, THE HUDSON  
RIVER STURGEON.  
PEOPLE WOULD BE AMAZED TO  
KNOW  
THAT THERE WERE EXTENSIVE  
FISHERIES FOR STURGEON  
IN ALL RIVERS OF THE ATLANTIC  
COAST  
AND THEY ARE GONE, AND THEY  
ARE NOT EVEN PERCEIVED AS  
LOST.  
IF WE WANT TO HAVE FISH IN THE  
FUTURE TO EAT  
FISH TO CONTRIBUTE TO  
DIVERSITY  
IF WE WANT TO HAVE MARINE  
HABITATS THAT ARE INTACT  
WE MUST GIVE THEM AT LEAST AS  
MUCH PROTECTION  
AS ON LAND WE GIVE TO LAND



ANIMALS AND LAND PLANTS.  
THAT IS, WE HAVE TO CREATE  
LARGE SPACES IN THE SEA  
EQUIVALENT TO NATIONAL PARKS.  
Narrator: PRESERVING LARGE  
AREAS OF THE OCEAN FROM  
FISHING  
WILL BUY TIME TO LEARN MORE  
ABOUT HOW OCEAN ECOSYSTEMS  
WORK  
AND HOW THEIR HEALTH  
DEPENDS  
ON AN INTRICATE BALANCE OF  
MANY INTERACTING SPECIES.  
IN THE OCEAN, THE RECENT  
DISCOVERY  
OF THE MOST ABUNDANT  
MICROSCOPIC  
PHOTOSYNTHESIZER --  
PROCHLOROCOCCUS, THE BASE  
OF THE OCEAN FOOD WEB --  
IS JUST ONE EXAMPLE OF HOW  
MUCH REMAINS TO BE  
DISCOVERED.  
Chisholm: WHAT MOST PEOPLE  
DON'T REALIZE  
IS THAT THE OCEANS ARE  
RESPONSIBLE  
FOR HALF OF THE  
PHOTOSYNTHESIS ON EARTH.  
PROCHLOROCOCCUS IS JUST ONE  
OF THE SURPRISES.

WE'RE GONNA HAVE MANY, MANY,  
MANY MORE --  
WE DO HAVE MANY DISCOVERIES  
LIKE THAT EVERY YEAR IN  
SCIENCE  
TELLING US, "OH, BOY  
WE REALLY DON'T UNDERSTAND  
HOW THIS SYSTEM WORKS."  
FOR ME, IT'S A CONSTANT  
REMINDER  
THAT WE REALLY DON'T  
UNDERSTAND THESE SYSTEMS.  
IF WE CONTINUE TO PLAY WITH  
THEM AND PERTURB THEM --  
MEANING THE HUMAN IMPACT ON  
THE GLOBAL ECOSYSTEM  
IN WAYS THAT ARE STRESSING  
THE SYSTEM --  
WITHOUT UNDERSTANDING HOW  
IT WORKS  
THEN I THINK THAT ANY HOPE  
FOR SUSTAINABLE USE OF THE  
EARTH'S RESOURCES BY HUMANS  
IS GREATLY DIMINISHED.  
AND WE'RE ONLY JUST BEGINNING  
TO UNDERSTAND  
HOW THE PLANKTON  
COMMUNITIES  
AND THE BIOLOGICAL  
PRODUCTION IN THE OCEAN  
AFFECTS THE CARBON CYCLE,  
AFFECTS OXYGEN PRODUCTION

AFFECTS THE NITROGEN CYCLE,  
AND ALL THIS STUFF.  
AND, YOU KNOW, IT'S AN  
UNCONTROLLED EXPERIMENT  
AND WE DON'T REALLY KNOW THE  
OUTCOME.  
AND, YOU KNOW, AT THAT LEVEL  
OF IGNORANCE  
TO BE MESSING AROUND WITH  
THE ORGANISMS  
THAT ARE RESPONSIBLE FOR THE  
REGULATION  
AND THE MODULATION  
OF THE LIFE-SUPPORT SYSTEM OF  
HUMANITY  
IS A BIG RISK.  
AND PEOPLE SAY, "YEAH, YEAH,  
YEAH  
WE OUGHT TO STUDY IT FOR 20  
MORE YEARS."  
BUT I WOULD SAY THAT NO --  
YEAH, WE SHOULD STUDY IT FOR  
20 MORE YEARS  
BUT WE OUGHT TO GET OUR ACT  
TOGETHER PRETTY SOON  
BECAUSE WE'RE PLAYING WITH  
FIRE  
AND THAT IS NOT AN  
EXAGGERATION.

Narrator: IN OUR EXPERIMENT --  
ALTERING OR DESTROYING

ECOSYSTEMS --  
ARE WE WILLING TO LIVE  
WITHOUT  
THE ESSENTIAL GOODS AND  
SERVICES THEY PROVIDE?  
NOT ONLY WITHOUT THE  
PRODUCTS THEY PROVIDE  
BUT THEIR CONTRIBUTIONS TO  
THE REGENERATION  
OF THE HUMAN SPIRIT.

Wilson: HUMANITY NEEDS  
CHOICES.  
HUMANITY NEEDS AND DESERVES  
THE CHOICE OF VISITING  
NATURAL AREAS  
IN WHICH THE HUMAN SPECIES  
EVOLVED  
AND TO WHICH WE ARE MORE  
AKIN AND SPIRITUALLY ATTACHED  
THAN MOST PEOPLE REALIZE.  
IF WE COMPLETELY HUMANIZE  
THE WORLD  
THEN THERE'S ONLY THAT  
CHOICE.  
IF WE LEAVE THESE RESERVES  
AND INCLUDE WILDERNESS  
AREAS IN THEM  
WHERE YOU CAN ENTER AND SEE  
THE PLANET AS IT WAS  
BEFORE HUMANITY BEGAN TO  
TRANSFORM IT

THEN WE HAVE A CHOICE.  
WE SHOULD NOT LET AN  
IRREPLACEABLE RESOURCE --  
HUMAN RESOURCE, IF YOU WANT  
TO CALL IT THAT --  
THE NATURAL PLACES IN THE  
WORLD DISAPPEAR  
BECAUSE ONCE THEY'RE GONE,  
THEY'RE GONE FOREVER.

Narrator: HUMANITY HAS REACHED  
A POINT  
WHERE WE AFFECT THE EARTH AT  
THE PLANETARY LEVEL.  
THE BIG UNKNOWN THAT  
INFLUENCES ALL EARTH SYSTEMS  
IS CLIMATE CHANGE.  
LINKED TO HUMAN EMISSIONS  
OF GREENHOUSE GASES LIKE  
CARBON DIOXIDE  
GLOBAL CLIMATE CHANGE IS  
ALREADY CHANGING THE EARTH  
SYSTEM.

Schrag: ONE OFTEN HEARS  
ENVIRONMENTAL SCIENTISTS  
TALKING ABOUT TIPPING POINTS.  
TIPPING POINTS ARE PARTS OF  
THE EARTH SYSTEM  
WHEN PUSHED TO SOME  
THRESHOLD  
THEY ACTUALLY RESPOND IN A  
VERY ABRUPT WAY

GENERALLY COLLAPSING.  
WE COULD BE TALKING ABOUT  
FISHERIES  
WHERE WE FISH UP TO A CERTAIN  
POINT  
AND THEN ALL OF A SUDDEN, AS  
WE FISH ANY MORE  
THE POPULATION COLLAPSES.  
WE COULD BE TALKING ABOUT A  
TROPICAL FOREST  
WHERE WE START CUTTING IT  
DOWN AND EVERYTHING LOOKS  
OKAY  
UNTIL SUDDENLY WE CUT ONE  
TREE AND ALL OF A SUDDEN  
THE FOREST IS NO LONGER ABLE  
TO SUSTAIN ITSELF.  
OR WE COULD BE TALKING ABOUT  
CLIMATE CHANGE  
WHERE WE ADD CARBON DIOXIDE  
TO THE ATMOSPHERE  
AND THE EARTH WARMS AND  
GREENLAND SLOWLY MELTS  
UNTIL ALL OF A SUDDEN  
SUDDENLY, IT STARTS TO MELT  
FASTER AND FASTER  
AND GREENLAND SUDDENLY  
COLLAPSES.  
THESE ARE TIPPING POINTS.  
MANY OF THEM ARE UNKNOWN IN  
THE EARTH SYSTEM  
BECAUSE WE DON'T THE DETAILS

OF HOW EVERYTHING WORKS  
WELL ENOUGH TO PREDICT  
EXACTLY WHERE THOSE  
THRESHOLDS ARE  
EXACTLY WHERE THE TIPPING  
POINTS MIGHT OCCUR.  
AND YET WE KNOW THEY'RE  
THERE, AND WE WORRY THAT  
MORE  
AND MORE HUMAN ACTIVITIES  
OVER THIS NEXT CENTURY  
ARE GONNA LEAD US TO  
IRREVERSIBLE CONSEQUENCES.  
THERE ARE SO MANY DIFFERENT  
WAYS  
THAT HUMANS AFFECT THE  
EARTH SYSTEM  
BUT CLIMATE CHANGE HAS THE  
POSSIBILITY  
OF BEING THE GRAND FINALE  
THE ONE OVERARCHING  
ENVIRONMENTAL CHANGE  
THAT AFFECTS ALL THE OTHER  
COMPONENTS.

Holdren: SO, YOU THINK ABOUT  
WHAT CLIMATE CHANGE COULD  
MEAN

WHY DOES IT MATTER?

IT MATTERS BECAUSE CLIMATE  
GOVERNS THE PRODUCTIVITY  
OF FARMS AND FORESTS AND  
FISHERIES.

CLIMATE GOVERNS THE  
PREVALENCE OF OPPRESSIVE  
HEAT AND HUMIDITY  
AND THUS THE LIVABILITY OF FOUR  
GREAT CITIES IN THE SUMMER.  
CLIMATE GOVERNS THE  
GEOGRAPHY OF DISEASE --  
WHAT PATHOGENS AND DISEASE  
VECTORS  
CAN LIVE IN WHAT ABUNDANCE IN  
WHAT PLACES.  
CLIMATE GOVERNS THE DAMAGES  
THAT WE HAVE TO EXPECT  
FROM FLOODS AND DROUGHTS  
AND WILDFIRES  
AND INTENSE TROPICAL STORMS,  
HURRICANES, AND TYPHOONS.  
CLIMATE GOVERNS THE DAMAGE  
WE HAVE TO EXPECT  
FROM INCREASING SEA LEVEL.  
IT GOVERNS THE DISTRIBUTION  
AND ABUNDANCE OF SPECIES --  
THE ORGANISMS WE VALUE, THE  
ORGANISMS WE HATE.  
ALL OF THAT IS AT RISK WHEN  
YOU DISRUPT THE CLIMATE  
AND WE ARE DISRUPTING THE  
CLIMATE.

Dr. Tans: SO, I THINK WE'RE  
BASICALLY ENDANGERING OUR  
OWN EXISTENCE.



GLOBALLY, OUR INFLUENCE, OR,  
YOU COULD SAY FOOTPRINT  
ON THE EARTH HAS BECOME SO  
STRONG  
THAT AS A RESULT OF OUR  
ECONOMIC ACTIVITIES  
PARTICULARLY OUR ENERGY USE  
WE'RE CHANGING THE EARTH'S  
CLIMATE.

Schrag: THE CLIMATE PROBLEM  
AND THE ENERGY PROBLEM  
ARE SO INTERCONNECTED THAT  
THEY'RE INSEPARABLE.

I ALWAYS TALK ABOUT THE  
CLIMATE-ENERGY CHALLENGE  
BECAUSE IT'S REALLY ONE  
PROBLEM.

WE HAVE TO PROVIDE ENERGY  
FOR HUMAN SOCIETY TO  
FLOURISH  
FOR ECONOMIC WELL-BEING TO  
CONTINUE  
AND AT THE SAME TIME  
NOT ADD GREENHOUSE GASES TO  
OUR ATMOSPHERE  
THAT WOULD DESTROY ALL  
THOSE THINGS WE WANT TO  
SUPPORT.

Dr. Tans: WE HAVE TO GET  
ENERGY TO RUN OUR SOCIETY  
IN SUCH A WAY THAT IT DOES NOT  
INVOLVE EMITTING CARBON

DIOXIDE.  
THAT'S A TOUGH JOB  
BECAUSE 90% OF OUR ENERGY  
PRODUCTION NOW  
INVOLVES EMITTING CARBON  
DIOXIDE.  
THIS WILL HAVE TO BE BROUGHT  
DOWN TO ZERO.

Field: I CAN'T REALLY ESCAPE THE  
CONCLUSION  
THAT THERE'S NOTHING MORE  
IMPORTANT  
THAN GETTING A HANDLE ON  
FOSSIL-FUEL EMISSIONS.  
THE DIFFERENCE IN IMPACTS  
BETWEEN A TRAJECTORY  
IN WHICH HUMANITY  
AGGRESSIVELY LOOKS  
FOR ALTERNATIVES TO FOSSIL  
FUEL  
AND A BUSINESS-AS-USUAL  
STRATEGY  
WHERE WE AGGRESSIVELY BURN  
ALL OF THE RESOURCES  
IS JUST PROFOUND, IN TERMS OF  
HUMAN HEALTH  
TRANSPORTATION, ECOSYSTEMS,  
ECONOMIC OPPORTUNITIES.  
AND I GUESS THIS IS SOMEWHAT  
LEAVING THE SCIENCE REALM  
BUT MY SENSE IS THAT

WE'RE REALLY ALMOST OUT OF  
TIME IN THIS BUSINESS  
AND THAT REAL LEADERSHIP  
COULD MAKE A DIFFERENCE  
IN BOTH CREATING ECONOMIC  
OPPORTUNITIES  
AND IN PREVENTING LONG-TERM  
DAMAGES.

Schrag: CLIMATE CHANGE IS A  
HUGE PROBLEM  
AND IT'S VERY EASY TO GET  
PESSIMISTIC  
TO THINK THAT THE PROBLEM IS  
SO HUGE, SO DIFFICULT TO SOLVE  
THAT WE'LL ACTUALLY NEVER BE  
ABLE TO DO ANYTHING ABOUT IT --  
WE SHOULD JUST SUCCUMB TO IT  
AND TRY TO ADAPT AS BEST WE  
CAN.

THE TRUTH IS THAT, IN FACT,  
THERE'S A LOT WE CAN DO  
THAT HUMANS HAVE A CHOICE.  
WE HAVE TECHNOLOGIES  
AVAILABLE NOW  
AND MORE THAT ARE AROUND  
THE CORNER.

THEY CAN ACTUALLY SUPPLY  
ENERGY FOR OUR SOCIETY  
WITHOUT PUTTING CARBON  
DIOXIDE INTO THE ATMOSPHERE.  
WILL WE STOP ALL CLIMATE  
CHANGE?

NO. CLIMATE CHANGE IS GONNA  
CONTINUE FOR DECADES TO  
COME.  
BUT WE CAN MINIMIZE ITS WORST  
IMPACTS  
KEEP THE CATASTROPHES FROM  
HAPPENING.  
AND THAT'S INCREDIBLY  
IMPORTANT  
AND THE IRONY IS IT WOULDN'T  
EVEN BE THAT EXPENSIVE.  
WE CAN REPLACE ALL OF OUR  
ENERGY INFRASTRUCTURE  
REBUILD ALL OF OUR POWER  
PLANTS FOR A SMALL FRACTION  
OF OUR TOTAL ECONOMIC  
WELL-BEING.

Holdren: WE KEEP HEARING,  
"WELL,WE'RE NOT GONNA  
CHANGE THIS"  
OR "WE'RE NOT GONNA CHANGE  
THAT BECAUSE IT'LL HURT THE  
ECONOMY."  
WHAT EVERYBODY NEEDS TO  
UNDERSTAND  
IS THAT NOT ADDRESSING THE  
RISKS OF CLIMATE CHANGE  
IS LIKELY TO HAVE FAR HIGHER  
COST TO THE ECONOMY  
THAN ADDRESSING IT.  
IT'S MUCH CHEAPER TO TAKE

PREVENTIVE ACTION  
THAN TO TRY COPE WITH  
DISASTER AFTER IT HAS  
OCCURRED.  
AND INDEED, THERE ARE MANY  
OPTIONS  
FOR ADDRESSING CLIMATE  
CHANGE  
THAT WE OFTEN CALL WIN-WIN  
OPTIONS  
BECAUSE WE CAN REDUCE  
GREENHOUSE-GAS EMISSIONS  
AND REDUCE HUMAN INFLUENCES  
ON CLIMATE  
WHILE GETTING OTHER BENEFITS  
WHILE PRESERVING BIODIVERSITY  
WHILE EXPANDING  
OPPORTUNITIES FOR  
SUSTAINABLE EMPLOYMENT  
BY PROMOTING INNOVATION THAT  
DEVELOPS NEW PRODUCTS  
THAT CAN DELIVER THE GOODS  
AND SERVICES THAT PEOPLE  
WANT  
IN CLIMATE-FRIENDLY WAYS.  
THERE'S LOTS OF OPPORTUNITY  
OUT THERE  
IN THE WAYS THAT WE ADDRESS  
THE CLIMATE ISSUE.  
THIS IS NOT SOMETHING THAT'S  
ALL ABOUT COST.  
Schrag: FIXING CLIMATE CHANGE

DOESN'T MEAN DOING LESS.  
IT MEANS DOING THE SAME  
THINGS WE DO TODAY  
JUST WITH BETTER  
TECHNOLOGIES, WITH SMARTER  
TECHNOLOGIES.  
IT MEANS DRIVING CARS IN THE  
FUTURE  
THAT DON'T RELEASE CARBON  
DIOXIDE INTO THE ATMOSPHERE.  
PERHAPS THEY'RE FUEL-CELL  
CARS  
FUELED BY HYDROGEN THAT'S  
PRODUCED FROM WIND OR  
SOLAR  
OR PERHAPS THEY'RE ELECTRIC  
CARS THAT ARE DRIVEN  
FROM ELECTRICITY FROM THOSE  
SOURCES.  
WHAT'S VERY CLEAR IN THE  
ENERGY SYSTEM  
IS THERE'S NO SILVER BULLET.  
THERE'S NO SINGLE SOLUTION TO  
ALL OF OUR PROBLEMS  
AND YET THERE'S A DIVERSITY OF  
APPROACHES OUT THERE  
THAT TOGETHER CAN REPLACE  
THE FOSSIL FUELS TODAY  
THAT ARE DRIVING THE CLIMATE  
PROBLEM.  
Wilson: I'VE OFTEN SAID THAT I'M  
CAUTIOUSLY OPTIMISTIC

AND PEOPLE IMMEDIATELY  
CHALLENGE ME  
AND SAY, "HOW COULD YOU BE  
ANY KIND OF OPTIMISTIC?"  
AND MY ANSWER IS, READING  
TRENDS  
AND ALSO HAVING SOME FAITH IN  
HUMAN NATURE.

Thompson: ALL WE CAN DO IS  
SHOW WHAT'S GOING ON OUT IN  
THE REAL WORLD  
AND GIVE THE BEST  
INTERPRETATION OF THAT.

AND ULTIMATELY, I BELIEVE THAT  
CHANGE WILL COME  
AND IT WILL APPEAR THAT IT  
HAPPENED OVERNIGHT.

WHAT'S VERY EXCITING RIGHT  
NOW  
IS THAT PEOPLE ALL OVER THE  
WORLD  
ARE BEGINNING TO WAKE UP TO  
THE CHALLENGE  
AND ACTUALLY TAKE THE  
RESPONSIBILITY THEMSELVES  
OF TRYING TO FIX THAT.  
I SEE BUSINESSES BEGINNING TO  
TAKE ACTION.  
I SEE PEOPLE, SMALL TOWNS,

AND CITIES  
ACTUALLY BEGINNING TO TAKE  
RESPONSIBILITY  
FOR FIXING THE CLIMATE  
PROBLEM.

NOW, THEY KNOW THAT  
INDIVIDUALLY  
THEY CAN'T DO VERY MUCH, AND  
YET THEY'RE STILL COMMITTED  
TO WORKING TO SOLVE IT  
TOGETHER.

Pringle: THE ONLY THING YOU CAN  
DO IS TRY AS AN INDIVIDUAL  
TO MAKE CHOICES THAT MAKE  
SENSE FOR BIODIVERSITY.

AND SO, WE COULD ALL GIVE UP  
BUT I THINK THAT WOULD BE AN  
AWFULLY SAD THING TO DO.

I THINK WE CAN EACH  
INDIVIDUALLY FIGHT FOR WHAT  
WE BELIEVE IN  
AND I THINK THAT'S WHAT WE  
SHOULD DO.

Thompson: AND I THINK THAT WE  
CAN DO IT ON A GLOBAL BASIS  
INTERNATIONALLY, TO SAVE A  
PLANET

A WAY OF LIFE.

AND TO ME, I KNOW IT'S POSSIBLE  
AND IT'S JUST HOW DO WE GET  
ALL ON THE SAME PAGE?



Schrag: THERE ARE MANY  
SCIENTISTS TODAYWORKING ON  
THESE PROBLEMS  
TRYING TO DEVELOP NEW  
SOLUTIONS.

BUT THE REAL SOLUTIONS  
AND THE IMPLEMENTATION OF  
THOSE SOLUTIONS  
IS GONNA COME FROM FUTURE  
GENERATIONS.  
AND WE HAVE AN INCREDIBLE  
RESPONSIBILITY  
TO TRAIN THOSE YOUNG MINDS  
THAT WILL ULTIMATELY STEP UP  
AND SOLVE THESE PROBLEMS IN  
THE FUTURE.

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