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Narrator: FOR THOUSANDS OF YEARS
OUR CAPACITY TO ALTER THE ENVIRONMENT
HAS GRADUALLY INCREASED.
DURING THE LAST CENTURY,
WE'VE REACHED THE POINT
WHERE OUR ACTIONS AFFECT
THE ENTIRE PLANET.
DEMOGRAPHER MARTHA FARNSWORTH RICHE
EXAMINES POPULATION DYNAMICS
IN COMMUNITIES ALL AROUND THE UNITED STATES
A NATION THAT HAS A DISPROPORTIONATELY LARGE IMPACT
ON THE ECOSYSTEM.
Dr. Riche: POPULATION GROWTH IS
HEADING TOWARDS SOME KIND OF STABILITY
AS PEOPLE REPLACE THEMSELVES.
BUT WHERE IT'S LOCATED AND
HOW THEY CONSUME --
THAT'S THE ISSUE FOR SUSTAINABILITY.

Narrator: DEMOGRAPHER
DEBORAH BALK
COMBINES DEMOGRAPHIC AND
SPACIAL DATA
TO EXAMINE HOW VULNERABLE
POPULATIONS
IN THE COASTAL REGIONS OF
DEVELOPING NATIONS
WILL BE AFFECTED BY CLIMATE
CHANGE.
Balk: PRIOR WORK HAS
PREDOMINANTLY LOOKED
AT THE CAUSES OF CLIMATE
CHANGE.
THIS STUDY ASKS, WHAT WILL
SOME OF THE CONSEQUENCES
OF CLIMATE CHANGE BE
AND WHAT WILL THOSE
CONSEQUENCES BE FOR HUMAN
POPULATION
AND FOR HUMAN SETTLEMENTS?
Narrator: PREDICTING FUTURE
POPULATION TRENDS
WILL HELP POLICY MAKERS PLAN
MITIGATION STRATEGIES
TO ENSURE A BETTER QUALITY OF
LIFE FOR COMING GENERATIONS
AND TO PROTECT OUR
ENVIRONMENT.

MARTHA FARNSWORTH RICHE IS
THE FORMER DIRECTOR

OF THE U.S. CENSUS BUREAU
WHO WAS INSTRUMENTAL IN
DESIGNING THE 2000 CENSUS.
Dr. Riche: DEMOGRAPHY IS REALLY
THE SCIENCE
OF STUDYING PEOPLE OR
STUDYING POPULATIONS.
IN THE STRICTEST SENSE, IT
REFERS TO STUDYING THE
GROWTH
OR THE DECLINE OF
POPULATIONS
IN TERMS OF, OBVIOUSLY,PEOPLE
BEING BORN
PEOPLE DYING, AND THEN
PEOPLE MOVING IN OR MOVING
AWAY.
PEOPLE ARE THE FOCUS OF
POLICIES.
THEY'RE THE FOCUS OF
PROGRAMS.
THEY'RE THE FOCUS OF
ADVERTISING
ENTERTAINMENT, WHAT HAVE
YOU.
BUT THEY'RE THE COMMON
DENOMINATOR.
WE DON'T HAVE AN IDEOLOGY.
WE COUNT AND WE PLACE
AND WE DESCRIBE.

Narrator: IN THE UNITED STATES

THE POPULATION IS MEASURED
BY THE U.S. CENSUS.
EVERY 10 YEARS
THE CENSUS COUNTS THE
NUMBER OF PEOPLE
LIVING IN EVERY HOUSEHOLD
ACROSS THE NATION.
DO THIS.
Narrator: THE CENSUS BUREAU
ALSO CONDUCTS ADDITIONAL
SURVEYS
ON SUCH TOPICS AS ECONOMICS,
HOUSING, AND HEALTH.

DEMOGRAPHERS USE DATA
COMPILED THROUGH THE CENSUS
AND ADDITIONAL SURVEYS TO
STUDY POPULATION DYNAMICS.

A QUESTION THAT PEOPLE HAVE
ABOUT THE CENSUS IS
"WHY SHOULD WE CARE?"
Dr. Riche: WHAT WE'VE FOUND
THAT PEOPLE CARED ABOUT
WAS WHAT DEMOGRAPHERS DO
WITH THE DATA.
PROBABLY THE THING THEY CARE
ABOUT MOST IS DISASTER RELIEF.
WHEN THERE'S A BIG NATURAL
DISASTER
LIKE THE EARTHQUAKE IN
CALIFORNIA BACK IN THE 1990s

I THINK IT WAS, OR THE
HURRICANES IN FLORIDA
THE RELIEF AGENCIES GO
STRAIGHT TO THE CENSUS
BUREAU.
THE CENSUS BUREAU RIGHT
AWAY PROVIDES DATA
OF HOW MANY PEOPLE PER
BLOCK, HOW MANY HOUSING
UNITS
WHAT THEIR ADDRESSES ARE --
"HERE ARE THE MAPS.
HERE'S HOW MANY PEOPLE YOU
SHOULD EXPECT TO FIND."
PEOPLE ALSO LIKE THE USEOF
THE CENSUS
FOR FIGURING OUT WHERE
SCHOOLS SHOULD BE
WHETHER WE NEED JUNIOR
HIGHS OR HIGH SCHOOLS.
THEY LIKE IT VERY MUCH FOR
HOSPITAL PLANNING
HEALTHCARE PLANNING.
AND THEY ALSO ARE AWARE
THAT THE GOVERNMENT USES
THE DATA FROM THE CENSUS
FOR TRAFFIC PLANNING --
WHAT STREETS ARE ONE-WAY
DURING RUSH HOUR
TO HELP YOU GET HOME FASTER.
THAT'S THE SORT OF THING
PEOPLE REALLY APPRECIATE.

Narrator: ANOTHER VALUABLE USE FOR CENSUS DATA
IS ITS APPLICATION TO ENVIRONMENTAL SCIENCE.
Dr. Riche: THE CENSUS IS A UNIQUE TOOL.
IT'S THE ONLY KIND OF SURVEYOR DATA-COLLECTION ENTERPRISE THAT WE OR ANY COUNTRY HAS THAT TELLS YOU HOW MANY PEOPLE ARE WHERE
AND THE HOW MANY AND THE WHERE ARE EQUALLY IMPORTANT.
MANY ENVIRONMENTALISTS THINK THAT POPULATION GROWTH
IS PART OF THE SUSTAINABILITY ISSUE FOR THE UNITED STATES.
THAT'S A DEBATABLE ASSUMPTION.
IT REALLY COMES BACK NOT TO HOW MANY PEOPLE
BUT TO HOW THEY LIVE AND TO HOW THEY USE RESOURCES.
ONE SOCIAL SCIENTIST HAS CALCULATED
THAT EVERYBODY IN THE WORLD, ALL 6.5 BILLION PEOPLE
COULD LIVE AND BE SUSTAINED IN THE STATE OF TEXAS.
THAT'S ONE EXTREME.
I DON'T THINK I'D LIKE TO LIVE IN

THE STATE OF TEXAS
WITH 6.5 BILLION PEOPLE.
SO IT REALLY COMES DOWN TO
HOW YOU DEFINE
SUSTAINABILITY.
IT'S A MATTER OF TRADE-OFFS.
Narrator: A QUESTION THAT
SCIENTISTS ASK IS
"HOW CAN AN INCREASING
POPULATION LIVE IN A WAY
THAT MINIMALLY IMPACTS THE
ENVIRONMENT?"
Dr. Riche: FOR INDIVIDUAL PLACES
THE QUESTION OF HOW MANY
AND WHERE
REALLY DRIVES THE
SUSTAINABILITY ISSUE.
QUITE NATURALLY, AS OUR
POPULATION HAS GROWN
IT'S PUT PEOPLE LIVING AND
WORKING IN AREAS
THAT MIGHT NOT HAVE BEEN
CONSIDERED SALUBRIOUS
OR EVEN VIABLE50 OR 100 YEARS
AGO.
THAT'S PARTICULARLY TRUE IN
THE SUNBELT --
THE PART OF THE COUNTRY
THAT'S THE SOUTHERN HALF --
BECAUSE THAT'S WHERE WE'VE
BEEN MOVING HEAVILY
SINCE AIR CONDITIONING CAME

INTO BEING, STARTING AFTER 1950.
WE SEE THATIN LOW-LYING AREAS --
AND NEW ORLEANS IS A GREAT EXAMPLE --
WE HAVE PEOPLE LIVING IN PLACES THAT ARE INUNDATED BY FLOODS
BY TORNADOES.
SAME THING IN FLORIDA, COAST OF TEXAS.
WE'VE SEEN ALL THAT.
IN THE SEMI-ARID OR ARID SOUTHWEST
WE HAVE PEOPLE USING WATER AT UNSUSTAINABLE RATES.
WHY DO WE HAVE PEOPLE IN NEVADA
RUNNING SPRINKLERS TO GROW NEW ENGLAND-STYLE GARDENS?
THAT'S A CHOICE THAT'S BEEN MADE
BUT NOW WE'RE COMING UP AGAINST NATURAL LIMITS.

Narrator: THE ARID SOUTHWEST IS NOT THE ONLY AREA IN THE UNITED STATES
FACED WITH WATER SUPPLIES REACHING THEIR NATURAL LIMITS.
CAPE COD, IN THE NORTHEAST

A REGION WITH RELATIVELY HIGH PRECIPITATION
IS EXPERIENCING ITS OWN SUSTAINABILITY ISSUES.
CAPE COD IS A LOCATION CONTAINING ECOSYSTEMS UNIQUE
TO THE NEW ENGLAND REGION.
WITH BEAUTIFUL SANDY BEACHES AND A RICH VARIETYOF NATURAL HABITATS
INCLUDING GRASSLANDS, WETLANDS
AND WOODLANDS
CAPE COD IS ONE OF THE MOST ATTRACTIVE RECREATIONAL AREAS
IN THE NATION FOR BOTH TOURISTS AND PERMANENT RESIDENTS.
Eichner: I THINK, IN GENERAL, THE CAPE COMMUNITY IS VERY AWARE
THAT WE LIVE IN A SENSITIVE AREA.
PEOPLE COME HERE BECAUSE OF ITS NATURAL BEAUTY
AND BECAUSE OF WHAT IT HAS TO OFFER.
AND WE NEED TO TAKE CARE OF THIS ENVIRONMENT.
Narrator: IN RECENT YEARS

CAPE COD HAS WITNESSED A LARGE INCREASE IN ITS POPULATION.
Stone: FROM 1950 TO CURRENT, THE POPULATION HAS GONE FROM
ABOUT 50,000, 45,000 ACROSS CAPE COD TO ABOUT 230,000 TODAY.
SO IT'S BEEN ONE OF THE FASTEST GROWING AREAS
IN MASSACHUSETTS.
THIS IS CENSUS DATA HERE SHOWING THE INCREASE IN POPULATION.
MORE RECENTLY, THE RED COLORS
ARE THE AREAS THAT ARE GROWING FASTEST.

Narrator: BRIAN DUDLEY IS AN ENVIRONMENTAL ENGINEER.
HIS FIELDWORK CONTRIBUTES TO THE UNDERSTANDING
OF WATER QUALITY DEGRADATION ACROSS THE CAPE.
Dudley: AS THE POPULATION ON THE CAPE HAS INCREASED
WE HAVE SEEN, OBVIOUSLY, A PROLIFERATION OF DEVELOPMENT.

THERE HAS BEEN AN INCREASE
IN THE AMOUNT OF WASTEWATER
THAT IS BEING GENERATED
AND, AS A RESULT, AN INCREASE
IN THE AMOUNT OF NITROGEN.
AND THAT HAS HAD A
DETRIMENTAL IMPACT ON A LOT
OF RESOURCES
NOT THE LEAST OF WHICH ARE
THE EMBAYMENTS
AND ESTUARIES ON THE CAPE
AND PART OF THE IMPACT HAS
BEEN LOSS OF EELGRASS BEDS
WHICH IN TURN MEANS THAT WE
HAVE LOSS OF SHELLFISH
HABITAT
FINFISH HABITAT.
Narrator: INADEQUATE TREATMENT
OF HUMAN WASTE
CONTRIBUTES TO THE
INCREASEIN NITROGEN LEVELS.
Eichner: WHAT WE'RE RUNNING
INTO RIGHT NOW
IS THAT WE ARE SEEING THE
IMPACT OF THE POPULATION
INCREASE
AND THE LIMITS OF THE
AVAILABLE WASTEWATER
TREATMENT TECHNOLOGY
THAT WE'VE GOT.
WE GET RID OF OUR
WASTEWATER

IN THE SAME SYSTEM THAT WE TAKE OUR DRINKING WATER FROM.
WE'RE SEEING WATER QUALITY IMPACTS
IN ALMOST ALL OF OUR SURFACE WATERS
AND THAT MEANS BOTH OUR SALTY ESTUARIES
AND OUR FRESHWATER PONDS.
THE MAJORITY OF THOSE ARE FALLING INTO THE CATEGORY OF BEING IMPAIRED.
SO, WE HAVE TO BALANCE HOW MANY PEOPLE WE HAVE
AND WE ALSO HAVE TO BALANCE THE TECHNOLOGY THAT WE USE TO TREAT THE WASTEWATER THAT WE PUT BACKINTO THE SYSTEM.
Narrator: ERIC DAVIDSON INVESTIGATES THE LEVELS OF NITROGEN FROM VEHICLE EMISSIONS
THE SIGNIFICANCE OF WHICH IS ONLY NOW BEING STUDIED.
HE ARRANGES AIR SAMPLERS AT DIFFERENT DISTANCES FROM ROADWAYS TO TRAP NITROGEN.
THE FILTERS ARE THEN TAKEN FOR ANALYSIS.

Dr. Davidson: WE'VE LEARNED THROUGH OUR RESEARCH
THAT THE SAMPLERS NEAREST THE ROAD
COLLECT ABOUT FIVE TIMES AS MUCH NITROGEN
AS THE SAMPLERS NEAREST TO ME, FURTHER AWAY FROM THE ROAD.
THIS IS ABOUT, OH, 150 YARDS FROM THE ROAD.
Narrator: BEFORE THE STUDY AT THE WOODS HOLE RESEARCH CENTER
THERE WAS LITTLE UNDERSTANDING
OF THE AMOUNT OF NITROGEN POLLUTION COMING FROM TRAFFIC.
Stone: BECAUSE THERE'S A LIMITED AMOUNT OF LAND AREA ON CAPE COD
THE NUMBER OF NEW ROADS IS NOT VERY LARGE
SO THE ROADS ARE USED MORE INTENSIVELY
AND ROADS THAT WERE DESIGNED FOR MAYBE 10,000 CARS PER DAY
NOW HAVE 20,000 AND 25,000 CARS PER DAY.
THERE'S REALLY NO PLACE TO

BUILD ADDITIONAL ROADS.
Dr. Davidson: BUSINESS AS USUAL IS NOT REALLY AN OPTION.
OUR ECONOMY IS BASED UPON HAVING TOURISTS
WANTING TO COME HERE AND SPEND TIME HERE.
THEY'RE NOT GONNA COME HERE IF THE ESTUARIES ARE FULL OF ALGAE THAT SMELL ROTTEN.
SO IT'S EXTREMELY IMPORTANT, AND WE'RE GETTING TO A TIPPING POINT
WHERE WE HAVE TO DO SOMETHING.
AND I THINK THE SAME IS TRUE ACROSS THE GLOBE.
Dudley:WE KNOW THAT PEOPLE ARE STILL GONNA WANT TO COME TO THE CAPE
AND THAT GROWTH ISGONNA CONTINUE
SO WHAT WE'RE REALLY INTERESTED IN TRYING TO DO
IS APPROPRIATELY MANAGE THAT GROWTH.
WE BELIEVE THAT WE CAN STILL SAVE THE HABITAT
AND THAT IT ISN'T BEYOND A POINT OF NO RETURN
AND THAT'S WHAT WE'RE ACTIVELY TRYING TO DO.

Narrator: BY COMBINING CENSUS DATA
WITH PHYSICAL DATA COLLECTED IN FIELD STUDIES
SCIENTISTS CAN INCREASE THE ACCURACY OF THEIR MODELS
AND HELP PLANNERS AND POLICY MAKERS
PREPARE FOR FUTURE GROWTH.
Dr. Riche: WHAT I DO, ESSENTIALLY IS GIVE PEOPLE THE BASE TO LOOK INTO THE FUTURE
BECAUSE WE MAKE CONNECTIONS BETWEEN PEOPLE AND ALL THESE THINGS THAT HAVE COSTS.
WE WILL COUNT HOW MANY PEOPLE ARE DRIVING S.U.V.s
AND HOW FAR THEY'RE DRIVING
VERSUS HOW MANY PEOPLE ARE TAKING PUBLIC TRANSPORT
AND THEN ENVIRONMENTALISTS OR THE RIGHT SORT OF DISCIPLINE
CAN PUT THAT TOGETHER
WITH THE FIGURESON FUEL CONSUMPTION AND USAGE
AND REALLY COME UP AND SEE, WHERE IS THE PUSH POINT?
Narrator: ONE POSSIBLE SOLUTION TO THE ENVIRONMENTAL IMPACT

OF CAPE COD'S INCREASING
POPULATION
IS A "SMART GROWTH"
APPROACH.
SMART GROWTH IS A PRACTICE
USED IN URBAN AREAS
TO AVOID URBAN SPRAWL
AND TO PLAN FOR LONG-TERM
ENVIRONMENTAL SUSTAINABILITY.
IT AIMS TO CONCENTRATE
POPULATION GROWTH
IN THE INNER CITY, LEAVING OPEN
AREAS RELATIVELY UNTOUCHED.
Stone: WE USE A COMPUTER
MODEL
THAT LOOKS AT ROAD COVERS
OVER TWO OR THREE POINTS IN
TIME
AND LAND COVER CHANGE OVER
TWO OR THREE POINTS IN TIME.
AND THEN WE CAN PROJECT OUT
INTO THE FUTURE
THE LIKELIHOOD OF CHANGE IN
THOSE AREAS, AS WELL
TO USING DIFFERENT TYPES OF
APPROACHES
WHETHER IT'S A SMART GROWTH
APPROACH
WHICH MINIMIZES THE AMOUNT
OF LAND CLEARED
OR WHETHER IT'S A
NO-HOLDS-BARRED

OR BUSINESS-AS-USUAL-TYPE APPROACH
WHICH IS UNCONTROLLED DEVELOPMENT, BASICALLY.
Narrator: CENSUS DATA COLLECTED ACROSS THE CAPE IS AN IMPORTANT TOOL
USED TO PREDICT THE EFFECT OF A SMART GROWTH APPROACH VERSUS THAT OF BUSINESS AS USUAL.
Stone: WE HAVE VERY GOOD CENSUS DATA AT THE TOWN LEVEL
THROUGHOUT ALL OF MASSACHUSETTS ABOUT WHERE GROWTH HAS OCCURRED
AND WE ARE CONFIDENT WE KNOW WHERE IT'S GOING TO OCCUR
BECAUSE IT'S GOING TO OCCUR CLOSE TO TRANSPORTATION CORRIDORS
AND THESE CORRIDORS CAN BE DEVELOPED
IN A SMART GROWTH TECHNIQUE CLUSTERING DEVELOPMENTS, OR YOU CAN USE SPRAWL
WHICH IS THE WAY IT HAS BEEN DONE IN THE PAST.
SPRAWL, OF COURSE, IS VERY LAND-CONSUMPTIVE.

YOU CAN ACCOMMODATE MOST
OF THE POPULATION GROWTH
THAT'S PROJECTED TO OCCUR
BY LOOKING AT SOME OF THE
AREAS THAT ARE ALREADY
DEVELOPED
AND REDEVELOPING SOME OF
THESE
USING THE WHOLE IDEA OF
SMART GROWTH.
Dr. Riche: CERTAINLY IN MY
LIFETIME
THE U.S. POPULATION HAS
TRIPLED.
PEOPLE THINK THAT IT'S BECAUSE
OF IMMIGRATION.
IMMIGRATION ACCOUNTS FOR
MAYBE HALF
OF OUR ANNUAL POPULATION
GROWTH.
OTHER PEOPLE THINK IT'S BIRTHS
BECAUSE WE HAVE A HIGHER
FERTILITY RATE
THAN OTHER INDUSTRIAL
COUNTRIES, BUT WE'RE
ACTUALLY
JUST REPLACING OURSELVES
THROUGH BIRTH.
PROBABLY THE PRIMARY DRIVER
OF OUR POPULATION GROWTH
IS THAT WE AREN'T DYING AS
YOUNG AS WE USED TO.

THAT 300-MILLIONTH PERSON
THAT THE NEWSPAPERS WERE
TRYING TO TRACE DOWN
THINKING THAT IT WASA BABY
BORN --
IT WASN'T A BABY BORN.
IT WAS SOMEONE WHO DIED ON A
WEDNESDAY INSTEAD OF
TUESDAY.
THAT WAS OUR 300-MILLIONTH
PERSON.
AND THAT'S A MAJOR SOURCE OF
OUR POPULATION GROWTH.
ONE DEMOGRAPHER, JOEL
COHEN, FROM ROCKEFELLER
UNIVERSITY
A FEW YEARS AGO, LOOKED AT
ALL THE ESTIMATES MADE
OF POPULATION SIZE AND
SUSTAINABILITY --
TRYING TO ANSWER THE
QUESTION, "HOW MANY ARE TOO
MANY?"
AND IT REALLY CAME DOWN TO A
HUGE ARRAY OF ESTIMATES
AND DEPENDED ON WHAT KIND OF
LIFE YOU WANTED.
AND THAT'S WHAT REALLY GOES
INTO THIS EQUATION.
IT'S A MATTER OF TRADE-OFFS.
Narrator: WHILE FARNSWORTH
RICHE'S RESEARCH

IS BASED MAINLY IN THE UNITED STATES
DEBORAH BALK'S STUDIES HAVE A PREDOMINANTLY GLOBAL PERSPECTIVE.
WITH 6.5 BILLION PEOPLE CURRENTLY LIVING ON THE PLANET
IT'S ESTIMATED THAT WORLD POPULATION MAY PEAK
AT AROUND 9.1 BILLION IN THE NEXT 50 YEARS.
SCIENTISTS PREDICT THAT CLIMATE CHANGE
LINKED TO GREENHOUSE-GAS EMISSIONS
WILL LEAD TO CHANGES IN THE GLOBAL ENVIRONMENT
INCLUDING A RISE IN OCEAN LEVELS.
IN DEVELOPING NATIONS, THE MAJORITY OF POPULATION GROWTH
IS PROJECTED TO TAKE PLACE IN CITIES.
MANY OF THESE CITIES
ARE SITUATEDIN LOW-LYING COASTAL AREAS --
AREAS MOST AT RISK FOR CLIMATE-CHANGE EFFECTS.
Balk: WE KNOW CLIMATE CHANGE WILL LEAD TO SEA-LEVEL RISE

AND THAT, OF COURSE, WILL
AFFECT COASTAL DWELLERS
MORE THAN OTHERS.
BUT WE ALSO KNOW THAT IT WILL
INCREASE STORM SURGES
AND FLOODING COASTAL IN
NATURE.
IN FACT, WE FOUND THAT
COASTAL ECOSYSTEMS
WERE DISPROPORTIONATELY
URBAN AND
DISPROPORTIONATELY DENSE
IN BOTH URBAN AND RURAL
AREAS.
AND THEREFORE, WE BECAME
PARTICULARLY INTERESTED
IN TRYING TO ESTIMATE THE
POPULATION
AND THE URBAN POPULATION
THAT WOULD BE AT GREATER
RISK
OF THE CONSEQUENCES OF
CLIMATE CHANGE.
Narrator: DEBORAH BALK
INCORPORATES SPACIAL DATA
AND METHODS
TO ASSESS POPULATION
CHARACTERISTICS AND
BEHAVIORS.
Balk: THERE'S A
DISPROPORTIONATE
CONTRIBUTION OF THE CAUSES

OF CLIMATE CHANGE COMING
FROM ONE SET OF COUNTRIES
MOSTLY THE WEST
AND A DISPROPORTIONATE SET
OF CONSEQUENCES, OR BURDEN
ON COUNTRIES THAT ARE
PREDOMINANTLY POOR.
AND IT TURNS OUT THAT SOME OF
THOSE COUNTRIES
ARE ALSO THE ONES THAT WILL
BE EXPERIENCING
THE MOST RAPID URBANIZATION
IN THE FUTURE.
AND MUCH OF THAT
URBANIZATION IS GOING TO
OCCUR
PROBABLY, IN THESE COASTAL
ZONES
AND LOW-ELEVATION COASTAL
ZONES AT THAT.
Narrator: BEFORE DEBORAH BALK
AND HER TEAM BEGAN THEIR
STUDY
THERE WAS NO ACCURATE
ESTIMATE
OF HOW MANY PEOPLE LIVE IN
COASTAL AREAS
WITHIN A 10-METER ELEVATION
ABOVE SEA LEVEL.
WHILE NO ONE EXPECTS OCEAN
LEVELS TO RISE 10 METERS
IT'S WITHIN THIS ZONE

THAT CLIMATE CHANGE WILL
HAVE THE MOST EFFECT
IN TERMS OF FLOODING AND
STORM SURGES
FROM MORE FREQUENT AND
MORE ENERGETIC COASTAL
STORMS.
Dr. Rumbaitis del Rio: THE FACT IS
THAT IN ASIA
YOU HAVE MANY SITUATIONS
WHERE YOU HAVE LARGE URBAN
AREAS IN VERY VULNERABLE
POSITIONS
AND BETWEEN BOTH OF THOSE
YOU HAVE THE POTENTIAL FOR A
LOT OF DAMAGE.
AND IF YOU TAKE A CITY LIKE
DHAKA
THAT IS LOCATED RIGHT ON THE
COAST
AND HAS A HUGE INFORMAL
SETTLEMENT POPULATION
WITH PEOPLE THAT ALREADY
DON'T HAVE GOOD ACCESS
TO SANITATION AND WATER
SYSTEMS
DON'T HAVE GOOD SEWAGE
SYSTEMS
SO WHEN THE CITY FLOODED IN
2005, THERE WERE MASSIVE
DEATHS.
WHEN YOU THINK ABOUT FLOODS

BECOMING MORE FREQUENT
IT'S A REAL PROBLEM.
Narrator: BALK'S TEAM STARTED THEIR STUDIES
BY COLLECTING CENSUS DATA CREATED IN COUNTRIES ACROSS THE WORLD.

ON THIS MAP OF THE DOMINICAN REPUBLIC
IRREGULAR RED LINES
SURROUND SUBNATIONAL ADMINISTRATIVE UNITS
FOR WHICH CENSUS DATA IS AVAILABLE.
ONE PROBLEM FOR BALK'S TEAM IS HOW TO RECONCILE THESE DATA
WITH PRECISE GRID-FORMAT SATELLITE DATA
SHOWN HERE IN BLUE.

TO OBTAIN BOUNDARIES OF URBAN AREAS
A THIRD SOURCE OF INFORMATION WAS USED --
NIGHTTIME IMAGES OF THE EARTH FROM SPACE.
Balk: NOAA PRODUCES A NIGHTTIME LIGHTS DATA SET
THAT WAS MEASURED IN 1994AND 1995

AND IT'S A GLOBALLY
CONSISTENT DATA SET.
THAT MEANS THEY USE THE SAME
MEASURES EVERYWHERE.
IT MEASURES BRIGHTNESS OF
PLACES.
WE COMBINED THE LIGHTS DATA
WITH THE POPULATION DATA
AS WELL AS A FEW OTHER DATA
SETS
TO MAKE SURE THAT WE CAN
CONFIRM
EACH LIGHT IS ACTUALLY A
POPULATION PLACE.
Narrator: USING A COMBINATION
OF VARIOUS POPULATION
AND GEOGRAPHIC DATA SETS
BALK IS ABLE TO DETERMINE HOW
MANY PEOPLE LIVE
IN LOW-ELEVATION COASTAL
ZONES.
Balk: THIS IS SOUTHERN VIETNAM.
SO, WE SEE THE WHITE AREAS
ARE ADMINISTRATIVE
BOUNDARIES.
THE RED AREAS INDICATE THE
NIGHT TIME LIGHTS --
THE URBAN AREAS.
AND THIS BLUE DATA SET IS THE
ELEVATION ZONE
THAT WE'VE CONSTRUCTED FROM
THE SRTM DATA --

SHUTTLE RADAR TOPOGRAPHY MISSION ELEVATION DATA SET.
SO, WE HAV EHO CHI MINH CITY HERE.
THAT'S THE BIG RED AREA.
AND WE'LL NOW ADD THE ELEVATION BUFFER.
THE AREAS THAT REMAIN BRIGHT RED ARE ABOVE 10 METERS
AND ALL OTHER AREAS RIGHT HERE WHERE THE BLUE HAS OVERTAKEN IT
//IS BELOW 10 METERS,
AND IT'S EVIDENT THAT THE ENTIRE CITY IS NOT BELOW 10 METERS
BUT MUCH OF IT IS.
THIS NOTION OF COMBINING THESE DIFFERENT TYPES OF DATA
AT THESE FINE RESOLUTION IS AN INNOVATION
AND IT'S AN IMPORTANT ONE FOR EFFECTING POLICY
BECAUSE WITHOUT DATA OF THIS TYPE
YOU CAN'T COME UP WITH ESTIMATES THAT ARE ACCURATE.
Narrator: AS PART OF THE WORLDWIDE EFFORT
PROJECTIONS FOR OCEAN-LEVEL RISE HAVE BEEN MADE

FOR THE NEW YORK
METROPOLITAN AREA
HOME TO APPROXIMATELY 20
MILLION PEOPLE.
Balk:AS I WAS DOING THIS
RESEARCH, SINCE WE'RE IN NEW
YORK
MANY PEOPLE SAID, "WELL, IS MY
HOME GONNA BE FLOODED
"IN THE NEXT 100 YEARS?
IS THIS COMMUNITY GOING TO BE
GONE?" AND SO FORTH.
AND THEREFORE, I BECAME
INTERESTED
IN COMING UP WITH ESTIMATES
FOR NEW YORK CITY.
Narrator: ALL FIVE BOROUGHS OF
NEW YORK CONTAIN DENSE
POPULATIONS
WITHIN THE LOW-ELEVATION
COASTAL ZONE.
Balk: THIS IS THE DISTRIBUTION OF
POPULATION.
THE DARKER THE COLOR, THE
MORE DENSE THE POPULATION.
SO, THIS IS AT FIVE METERS.
NOW SEVEN METERS.
AND NOW 10 METERS.
Narrator:IN NEW YORK, STORM
SURGES REACH THREE METERS
ABOVE SEA LEVEL
ABOUT ONCE A CENTURY.

THESE 100-YEAR STORMS CAUSE SEVERE FLOODING
AND DAMAGE IN COASTAL AREAS ENDANGERING ESSENTIAL INFRASTRUCTURE
SUCH AS POWER STATIONS AND WATER-TREATMENT FACILITIES.
MODELS PREDICT THAT CLIMATE CHANGE
MAY REDUCE THE AVERAGE INTERVAL
BETWEEN THESE SO-CALLED 100-YEAR STORMS
TO ONCE EVERY 19 YEARS BY MID-CENTURY
AND POSSIBLY AS OFTEN AS EVERY 4 YEARS BY 2080.

ONE NEW YORKER RAISING AWARENESS OF THE POTENTIAL IMPACT
OF CLIMATE CHANGEIS ARTIST EVE MOSHER.
ALL RIGHT, LET'S GO FOR A WALK.

Mosher: I'M WORKING ON A PUBLIC ART PROJECT
CALLED THE HIGH WATERLINE PROJECT, AND FOR THE PROJECT I'M DRAWING THE
10-FOOT-ABOVE-SEA-LEVEL LINE AROUND THE ENTIRE COAST OF

BROOKLYN AND LOWER MANHATTAN
SO IT'S ALMOST 70 MILES THAT I'M COVERING.
AND THE POINT OF THE PROJECT IS TO GET OUT INTO THE COMMUNITIES
THAT ARE GONNA BE AFFECTED BY THAT
AND GIVE THEM A VISUAL IDEA OF WHAT THAT MEANS --
WHAT THE
10-FOOT-ABOVE-SEA-LEVEL LINE MEANS
AND ALSO GIVE THEM THE TOOLS TO DO SOMETHING ABOUT THAT.
SO, ALONG MY WAY, I'M HANDING OUT ACTION PACKETS
THAT GIVE PEOPLE TIPS ON HOW TO LIVE MORE SUSTAINABLY.
A REALLY IMPORTANT PART OF MY PROJECT
IS THE WHOLE HUMAN ELEMENT.
I THINK A LOT OF TIMES, THEY DON'T KNOW
"OKAY, CLIMATE CHANGE -- FIRST OF ALL, WHAT DOES THAT MEAN?
AND THEN, WHAT DO I DO ABOUT IT?"
SO, YOU HAVE THE MEDIA SCARING YOU INTO THINKING CLIMATE CHANGE -- WE JUST

CAN'T DO ANYTHING ABOUT IT.
WE SHOULD ALL PANIC AND RUN AWAY TO HIGHER GROUND.
BUT THERE ARE THINGS WE CAN DO ABOUT IT.
SO, IT'S NICE TO BE ABLE TO GET OUT AND TALK TO PEOPLE.
AND I'VE FOUND THAT NO MATTER WHAT BACKGROUND
NO MATTER WHERE PEOPLE COME FROM
THEY'RE ALL REALLY INTERESTED IN TALKING ABOUT IT
BECAUSE THEY DO UNDERSTAND THAT IT IS A FUTURE
THAT COULD HAPPEN IN OUR NEIGHBORHOODS
OR IN THE NEIGHBORHOODS THAT I'M IN.
THIS AREA MOST LIKELY IS WHERE THE FLOOD WOULD APPEAR?
YEAH, IT WOULD COME IN THIS WAY.
THE PAEDERGAT WOULD OVERFLOW -- THE BASIN OVER THERE.
YEAH.
YOU WOULD GET FLOODED IN THIS AREA HERE.
IT HAPPENED IN CONEY ISLAND A COUPLE YEARS AGO.

YEAH, CONEY ISLAND'S
EXTREMELY SUSCEPTIBLE TO
FLOODING.
AND THAT'S GONNA BE A BIG DEAL
BECAUSE THE WHOLE COASTLINE
OF NEW YORK CITY IS GONNA
CHANGE.
THANK YOU FOR YOUR ADVICE.
THANKS FOR STOPPING. YEAH. I
HOPE HE FEELS BETTER.
THANK YOU VERY MUCH.
ONE OF THE THINGS THAT I DID
ALSO DISCOVER
WHEN I WAS MAPPING OUT THE
LINE
IS THAT THERE ARE A LOT O
FPUBLIC HOUSING ALONG THE
COAST
AND CURRENTLY YOU HAVE A LOT
OF POOR PEOPLE
LIVING IN THE COASTAL
COMMUNITIES, SO THEY'RE THE
ONES
WHO ARE REALLY GONNA BE
AFFECTED BY THIS
WHICH IS SIMILAR TO THINGS IN
THE REST OF THE WORLD
WHERE BANGLADESH IS A VERY
POOR COUNTRY
THAT'S VERY SUSCEPTIBLE TO
CLIMATE CHANGE AND FLOODING.
Narrator: WITH MANY OF THE

WORLD'S POOR
AND DISADVANTAGED LIVING IN ENDANGERED COASTAL ZONES
PLANNING FOR THE FUTURE IS BECOMING CRITICAL.
Dr. Rumbaitis del Rio: NEW YORK CITY IS ONE EXAMPLE
WHERE THE MAYOR IS STARTING TO THINK ABOUT CLIMATE CHANGE
BOTH IN TERMS OF CUTTING GREENHOUSE GASES
AND MAKING THE CITY MORE LIVABLE
BUT ALSO COPING WITH SOME OF THE DANGERS OF CLIMATE CHANGE.
THE ISSUE IS THAT IT'S NOT JUST NEW YORK CITY
THAT NEEDS TO BE TAKING THIS ON.
IT'S REALLY ALL CITIES, BOTH LARGE AND SMALL.
SO, THERE'S A LOT OF PLANNING WORK
AND LEARNING THAT NEEDS TO BE DONE.
AND I THINK IT'S IMPORTANT FOR GLOBAL LEADERS
TO START TAKING THE LEAD ON THIS ISSUE
AND UNDERSTANDING THAT

PEOPLE ARE AT RISK
EVEN IF THEY'RE LIVING IN THE DEVELOPED WORLD
BUT PARTICULARLY IN THE DEVELOPING WORLD
WHERE RESOURCES ARE LESS,
WHERE THE POOR ARE MORE VULNERABLE
AND DEPENDENT ON FAULTY INFRASTRUCTURES TO BEGIN WITH
WHERE THE POTENTIAL FOR REALLY CATASTROPHIC SITUATIONS TO OCCUR
ARE VERY LIKELY.
Narrator: DEBORAH BALK'S STUDY HAS DETERMINED
THAT MORE THAN 600 MILLION PEOPLE WORLDWIDE
LIVE WITHIN THE 10-METER LOW-ELEVATION COASTAL ZONE
WITH MORE THAN HALF CONCENTRATED IN HIGHLY POPULATED URBAN AREAS.
Balk: ONE OF THE THINGS THAT WE LEARNED IN THIS STUDY
WAS THAT THE LOW-ELEVATION COASTAL ZONE IN SOME AREAS
BANGLADESH AND CHINA BEING TWO EXAMPLES
IS URBANIZING AT A MUCH FASTER RATE

THAN WE SEE ELSEWHERE IN
THOSE COUNTRIES.

THOSE ESTIMATES ARE GOING TO
BE FUNDAMENTALLY IMPORTANT
TO POLICY MAKERS AND TO
FUTURE STUDIES
THAT WILL ALLOW US TO
CONSIDER FUTURE RATES OF
URBANIZATION
WHO'S GONNA LIVE WHERE.
HOPEFULLY IN THE FUTURE
WE CAN ALSO ASK MORE ABOUT
THE CHARACTERISTICS
OF PEOPLE LIVING IN THESE
VARIOUS PLACES.
AND I THINK THIS PIONEERING
APPROACH THAT WE'VE ADOPTED
OFFERS A LOT OF PROMISE
FOR COMING UP WITH MUCH
MORE RIGOROUS ESTIMATES
AND DESCRIPTIONS OF CURRENT
POPULATION, FUTURE
POPULATION
CURRENT ENVIRONMENTAL
CONDITIONS
AND FUTURE ENVIRONMENTAL
CONDITIONS.

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