

World Energy Engineering Congress

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President



Photo: Nitish Meena

PLAN FOR RESILIENCE TO SAVE LIVES AND BUSINESSES

ENERGY, WATER, AND ENVIRONMENTAL SUSTAINABILITY AND RESILIENCE

Businesses and governments need to take resiliency seriously and plan for it. If they don't, they are subject to litigation, not only revenue can be lost, but also lives.

To reduce and mitigate the risks we can build higher bridges and stronger infrastructure, adopt stormwater and energy management practices, and create backup plans. But when disasters happen we need to recover and adapt quickly.

ENERGY GOALS AND PRIORITIES



**IMPROVE
RESILIENCY**



**REDUCE
DEMAND**



**ASSURE
SUPPLY**



**PROMOTE
ENERGY
CONSCIOUS
CULTURE**



SEA LEVEL RISE
AND FLOODING BY 2050

EXPECTED SEA LEVEL RISE (SLR)
FROM **8 IN** IN 1992
TO ESTIMATED **1.24 FT**
COASTAL AREAS WILL FACE
30 OR MORE DAYS
OF FLOODING EACH YEAR
BECAUSE OF SLR

Photo: Bruno Camargo

Source: NOAA



U.S. BILLION-DOLLAR
WEATER AND CLIMATE
DISASTERS 1980-2016

196 DISASTERS SINCE 1980
TOTAL COST OVER **\$1.1 TRILLION**
THE 1980-2015 ANNUAL
AVERAGE IS **5.2 EVENTS**
8 EVENTS IN 2016:
2 FLOODING AND
6 SEVERE STORMS

Photo: David Crekveill Mediante

Source: NOAA

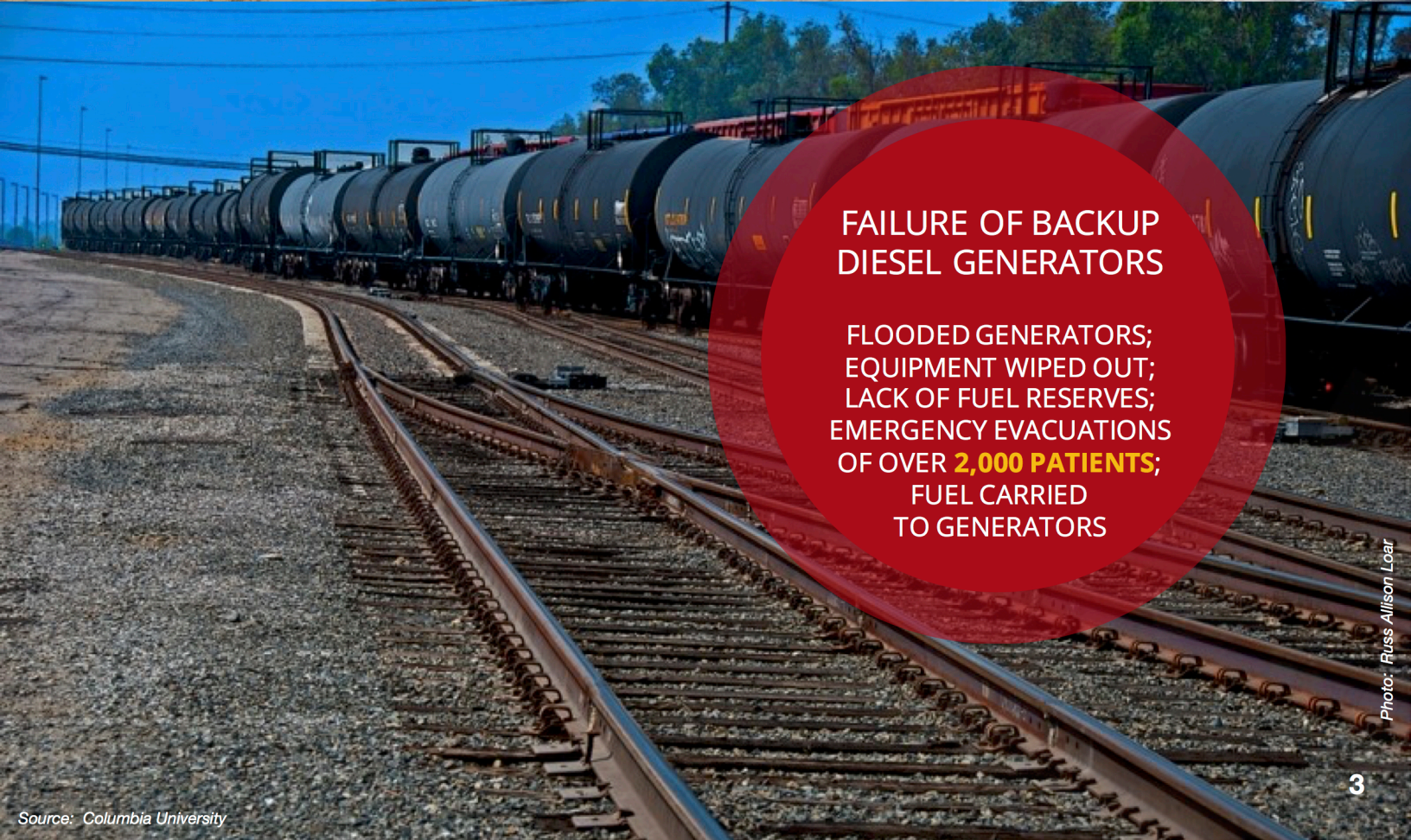


SUPERSTORM SANDY

ESTIMATED COSTS **\$67.6 BILLION**;
159 DEATHS;
STORM SURGE **12.65 FT** IN NY;
650,000 HOUSES DAMAGED OR
DESTROYED;
8.5 MILLION CUSTOMERS
LOST POWER

Photo: NASA

Source: NOAA



FAILURE OF BACKUP DIESEL GENERATORS

FLOODED GENERATORS;
EQUIPMENT WIPED OUT;
LACK OF FUEL RESERVES;
EMERGENCY EVACUATIONS
OF OVER **2,000 PATIENTS**;
FUEL CARRIED
TO GENERATORS

Photo: Russ Allison Loar

Source: Columbia University

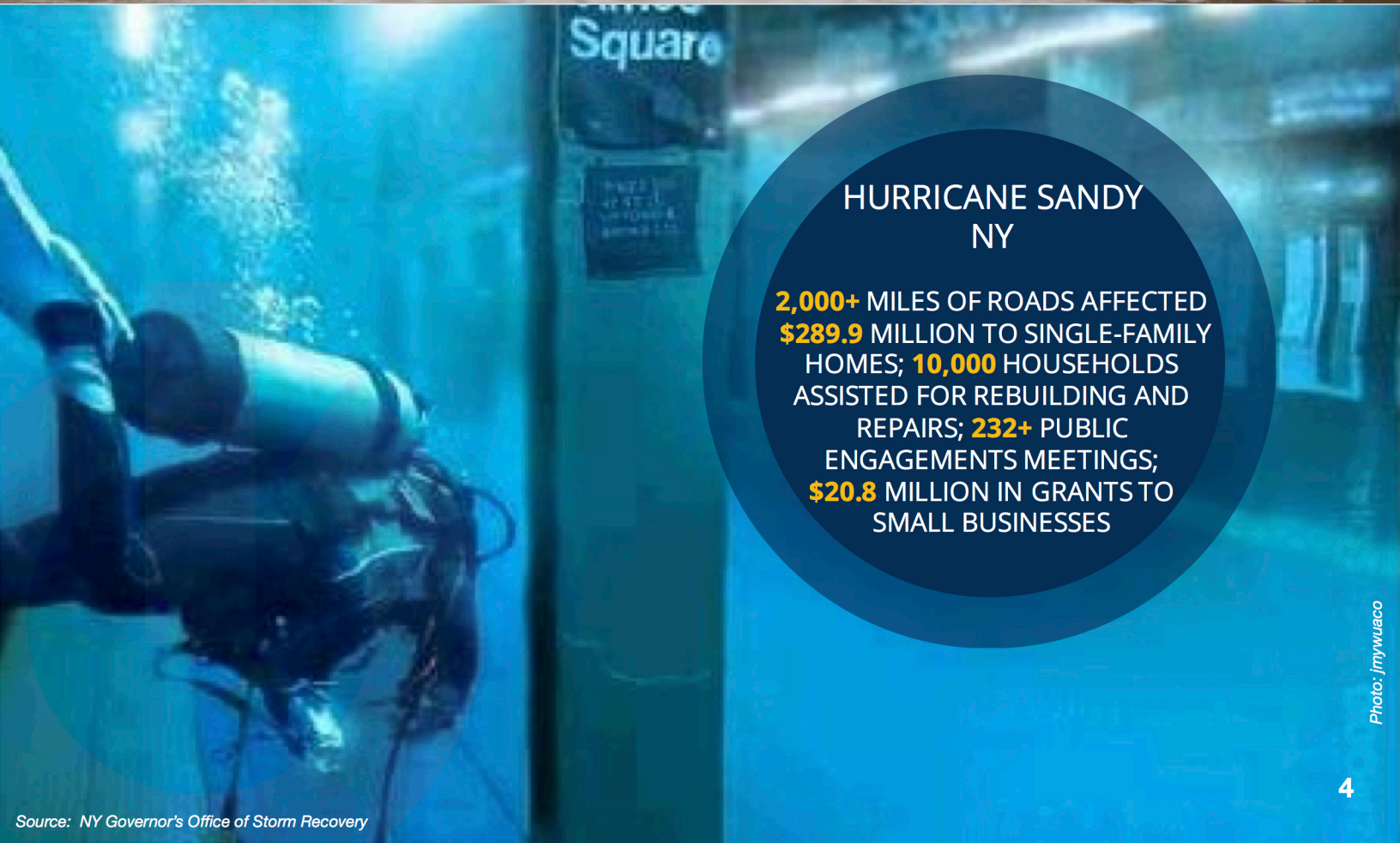


FAILURE TO PREPARE FOR RAINS AND FLOODING

IN 2014 FARMERS INSURANCE FILED **9 CLASS ACTIONS** AGAINST NEARLY **200 COMMUNITIES** IN THE CHICAGO AREA. THE LAWSUITS WERE LATER WITHDRAWN.

Photo: johndal

Source: NBC, Reuters



HURRICANE SANDY NY

2,000+ MILES OF ROADS AFFECTED
\$289.9 MILLION TO SINGLE-FAMILY HOMES; **10,000** HOUSEHOLDS ASSISTED FOR REBUILDING AND REPAIRS; **232+** PUBLIC ENGAGEMENTS MEETINGS; **\$20.8** MILLION IN GRANTS TO SMALL BUSINESSES

Photo: jmywuaco

Source: NY Governor's Office of Storm Recovery



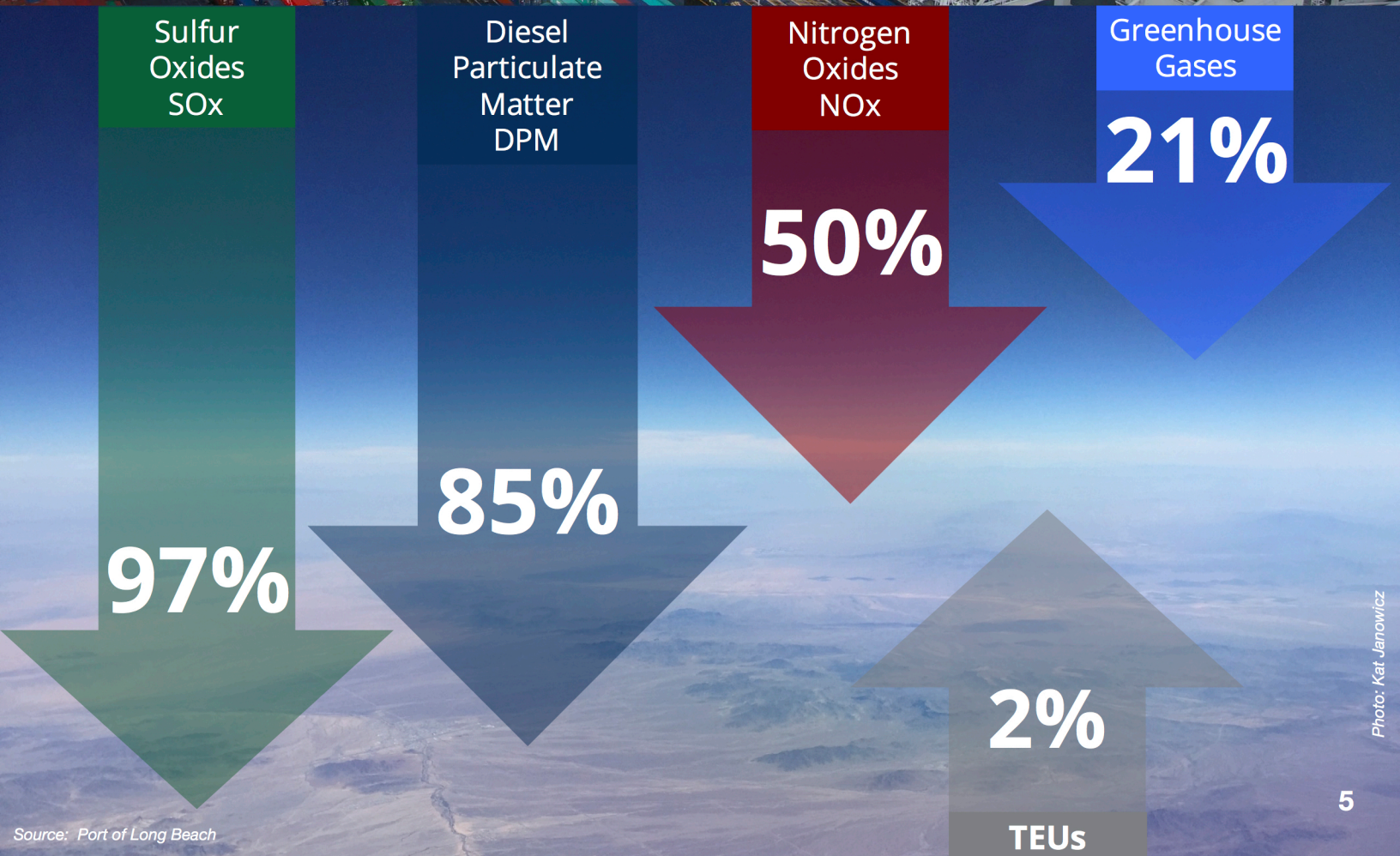
GREEN PORT TREND
SPRUNG FROM
LITIGATIONS AND PROTESTS

ENVIRONMENTAL IMPACT REPORTS
CHALLENGED,
LAWSUITS, DELAYS, HIGH COSTS,
E.G. **\$50 MILLION** MITIGATION;

GREEN PORT POLICY
ADOPTED **IN 2005**

Source: Port of Long Beach, Port of Los Angeles

Photo: Port of Long Beach



Source: Port of Long Beach

Photo: Kat Janowicz



EMISSIONS REDUCTION

2015 EPA CLEAN AIR ACT (**CAA**);
MERCURY AND AIR TOXICS
STANDARDS (**MATS**); CROSS STATE
AIR POLLUTION RULE (**CSAPR**);
NHTSA CORPORATE AVERAGE FUEL
ECONOMY (**CAFE**) STANDARDS;
STATE LAWS; PRESIDENT'S GOAL
OF **80%** OF CLEAN POWER
BY 2035

Photo: Kat Janowitz

Source: EPA, DOT, The White House



SHORTAGE IN ENERGY SUPPLY
2012-2020 **60 GW** OF COAL-FIRED
PLANTS WILL **RETIRE**;
UNEXPECTED SHUTDOWNS, E.G.
SONGS

INCREASING DEMAND WILL
QUADRUPLE AT SAN PEDRO BAY
PORTS

UTILITIES **UNABLE** TO
MEET DEMANDS

Photo: cherezoff

Source: EPA, EIA, San Pedro Bay Ports



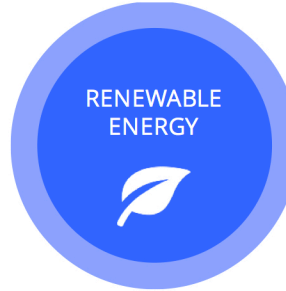
POTENTIAL ECONOMIC IMPACT*
\$3.7 TRILLION - \$10.8 TRILLION
10-20% POTENTIAL COST REDUCTION IN TREATMENT OF CHRONIC DISEASES THROUGH REMOTE HEALTH MONITORING



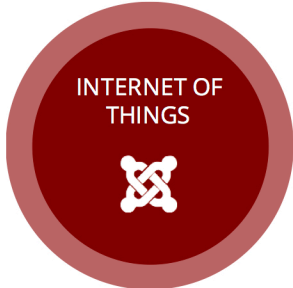
POTENTIAL ECONOMIC IMPACT*
~\$3.7 TRILLION - \$10.8 TRILLION
40-100% OF NEW VEHICLES SOLD IN 2025 COULD BE ELECTRIC OR HYBRID



POTENTIAL ECONOMIC IMPACT*
\$1.7 TRILLION - \$6.2 TRILLION
15-20% POTENTIAL PRODUCTIVITY GAINS ACROSS IT INFRASTRUCTURE, APPLICATION DEVELOPMENT, AND PACKAGED SOFTWARE



POTENTIAL ECONOMIC IMPACT*
\$0.2 TRILLION - \$0.3 TRILLION
POTENTIAL TO AVOID EMISSIONS OF **1,000 MILLION - 1,200 MILLION TONS OF CO₂** ANNUALLY BY 2025



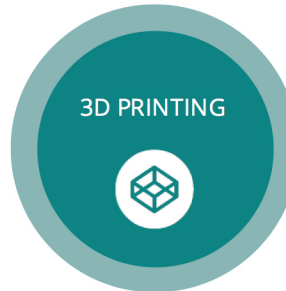
POTENTIAL ECONOMIC IMPACT*
\$2.7 TRILLION - \$6.2 TRILLION
OFFERS POTENTIAL TO DRIVE **PRODUCTIVITY ACROSS \$36 TRILLION** IN OPERATING COSTS OF KEY AFFECTED INDUSTRIES: MANUFACTURING, HEALTH CARE, AND MINING



POTENTIAL ECONOMIC IMPACT*
\$0.1 TRILLION - \$0.5 TRILLION
OFFERS POTENTIAL TO SUPPLY AN **ADDITIONAL 3.6 BILLION - 6.2 BILLION OIL-EQUIVALENT BARRELS** OF OIL AND GAS ANNUALLY BY 2025



POTENTIAL ECONOMIC IMPACT*
\$5.2 TRILLION - \$6.7 TRILLION
ADDITIONAL LABOR PRODUCTIVITY COULD EQUAL THE OUTPUT OF **110 MILLION - 140 MILLION** FULL TIME WORKERS



POTENTIAL ECONOMIC IMPACT*
\$0.2 TRILLION - \$0.6 TRILLION
CONSUMERS USE OF 3-D PRINTING COULD SAVE THEM **35-60% IN COSTS** PER PRINTED PRODUCT, WHILE ENABLING A HIGH LEVEL OF CUSTOMIZATION



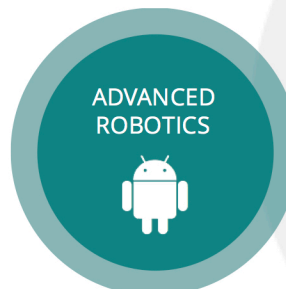
POTENTIAL ECONOMIC IMPACT*
\$0.2 TRILLION - \$0.5 TRILLION
NANOMEDICINE COULD BE USED TO **DELIVER TARGETED DRUGS** TO 20 MILLION NEW CANCER CASES WORLDWIDE IN 2025



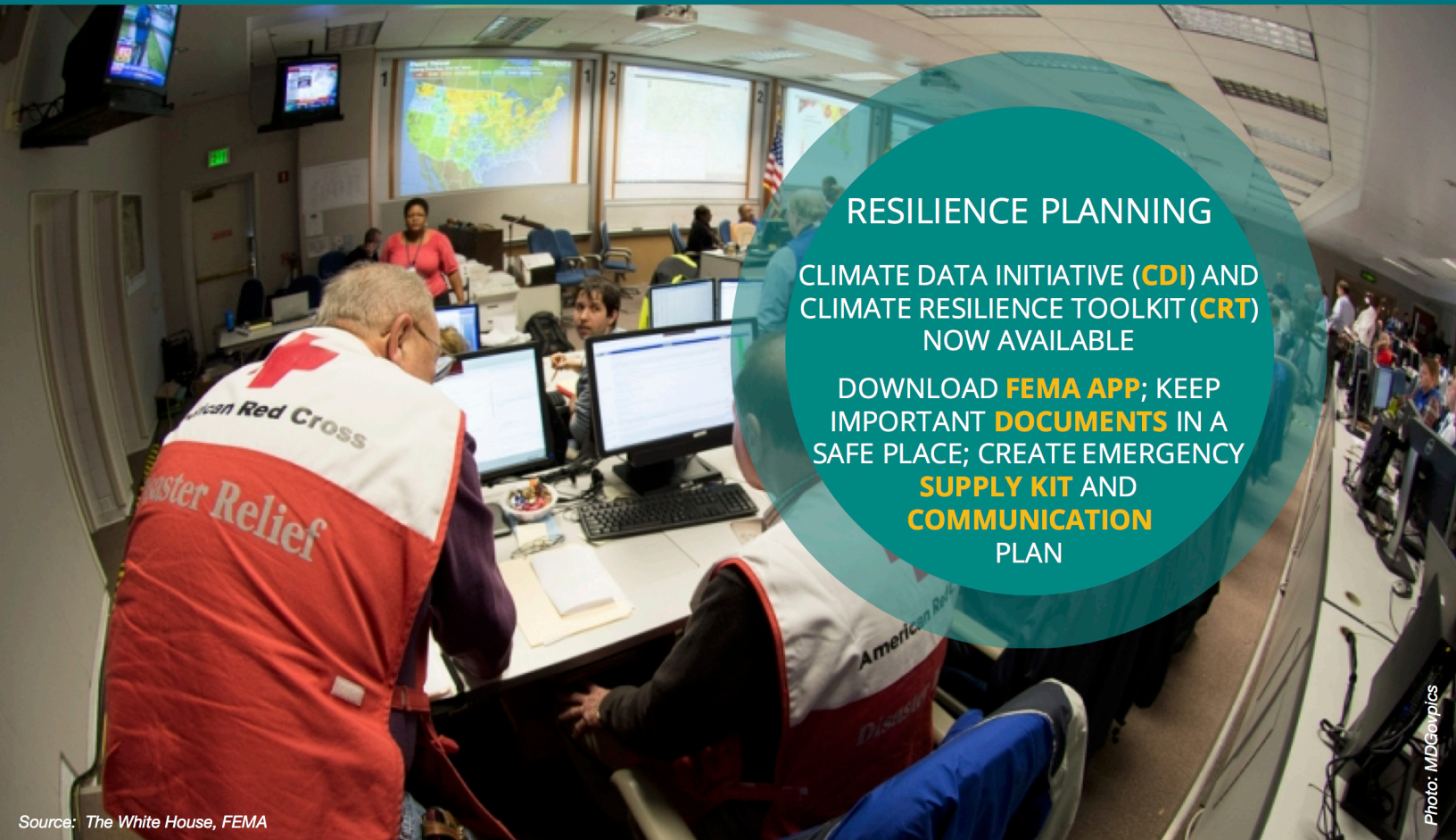
POTENTIAL ECONOMIC IMPACT*
\$0.2 TRILLION - \$1.9 TRILLION
COULD SAVE **30,000-150,000 LIVES** FROM POTENTIALLY FATAL TRAFFIC ACCIDENTS



POTENTIAL ECONOMIC IMPACT*
\$0.7 TRILLION - \$1.6 TRILLION
EXTENDING AND ENHANCING LIVES ACCOUNTS FOR 75% OF POTENTIAL IMPACT, E.G. THROUGH FASTER DISEASE DETECTION, NEW DRUGS



POTENTIAL ECONOMIC IMPACT*
\$1.7 TRILLION - \$4.5 TRILLION
OFFERS POTENTIAL TO **IMPROVE THE LIVES** OF 50 MILLION AMPUTEES AND THOSE WITH IMPAIRED MOBILITY



RESILIENCE PLANNING

CLIMATE DATA INITIATIVE (**CDI**) AND CLIMATE RESILIENCE TOOLKIT (**CRT**) NOW AVAILABLE

DOWNLOAD **FEMA APP**; KEEP IMPORTANT **DOCUMENTS** IN A SAFE PLACE; CREATE EMERGENCY **SUPPLY KIT** AND **COMMUNICATION PLAN**

Photo: MDGovpics

Source: The White House, FEMA



ENGAGE COMMUNITIES EARLY AND OFTEN

DOCUMENT PROJECT OUTCOMES; COORDINATE WITH **OTHER PROGRAMS**; LEVERAGE LOCAL **MEDIA**; ENGAGE **ASSOCIATIONS** FOR A THIRD-PARTY PERSPECTIVE; ASSIGN **RESPONSIBILITIES**; USE **LANGUAGE** EASY TO UNDERSTAND

Photo: Rawpixel

Source: FEMA

6 RESILIENCE GOALS



9 CROSS-CUTTING RECOMMENDATIONS

	PROTECT, UPGRADE, AND STRENGTHEN EXISTING SYSTEMS
	REBUILD SMARTER: ENSURE REPLACEMENT WITH BETTER OPTIONS AND ALTERNATIVES
	ENCOURAGE THE USE OF GREEN AND NATURAL INFRASTRUCTURE
	CREATE SHARED EQUIPMENT AND RESOURCE RESERVES
	PROMOTE INTEGRATED PLANNING AND DEVELOP CRITERIA FOR INTEGRATED DECISION-MAKING FOR CAPITAL INVESTMENTS
	ENHANCE INSTITUTIONAL COORDINATION
	IMPROVE DATA, MAPPING, VISUALIZATION, COMMUNICATION SYSTEMS
	CREATE NEW INCENTIVE PROGRAMS TO ENCOURAGE RESILIENT BEHAVIORS AND REDUCE VULNERABILITIES
	EXPAND EDUCATION, JOB TRAINING AND WORKFORCE DEVELOPMENT OPPORTUNITIES