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AEESP Converging COVID-19, environment, health, & equity conference

Session 4 Transcript – November 6, 2020

GOOD AFTERNOON,
EVERYONE.

WELCOME TO AEESP CONVERGING COVID-19 ENVIRONMENT, HEALTH AND EQUITY.
TODAY WE WILL BE SPEAKING ON COVID-19 AND SUSTAINABLY SUPPLYING FOOD AND
WATER AND ENERGY.

I'M MAYA, AND CO-HOSTING THIS CONFERENCE ALONG WITH DR. COLLEEN NAUGHTON
FROM THE UNIVERSITY OF CALIFORNIA.

SO WE ARE RECORDING THIS WEBINAR SO CONTINUING TO VIEW IT, JUST BE AWARE
EVERYBODY THAT YOU ARE CONSENTING TO BEING RECORDED.

SOME DIRECTIONS FOR VIEWING THIS OPTIMALLY WE DO RECOMMEND THAT YOU DO SIDE
BY SIDE GALLERIES SO THAT YOU CAN SEE BOTH THE PRESENTATION AND THE PRESENTER.
AND WE ALSO HAVE SIGN LANGUAGE INTERPRETATION AND THE BEST WAY TO SEE THAT IS
VIA SIDE BY SIDE GALLERY.

FOR SOME OF YOU THAT SHOWED UP ON THE TOP SCREEN.

AND WE ALSO HAVE CLOSED CAPTIONING WHICH YOU CAN ENABLE IN THE BOTTOM YOUR
SCREEN AND YOU CAN SEE THESE CLOSED CAPTIONING COME OFF IF YOU ARE WATCHING
THIS ON ZOOM.

PLEASE SEND IN QUESTIONS AND WE WILL ANSWER THEM DURING THE Q&A TODAY.

BEFORE WE GO ANY FURTHER I WANT TO SHOW YOU A VIDEO TO WELCOME YOU TO THIS
CONFERENCE SERIES.

¶[MUSIC]¶

IT GIVES ME GREAT PLEASURE RIGHT NOW TO INTRODUCE DR. PABLO CORNEJO, WHO IS AN
ASSISTANT PROFESSOR HE IS CALIFORNIA STATE UNIVERSITY CHICO IN THE DEPARTMENT
OF CIVIL ENGINEERING.

DR. CORNEJO IS GOING TO BE THE MODERATOR FOR TODAY'S SESSION.

HIS RESEARCH FOCUSES ON THE LIFE CYCLE ENVIRONMENTAL IMPACTS OF CENTRALIZED
AND DECENTRALIZED WASTE WATER AND RESOURCE RECOVERY MANAGEMENT
STRATEGIES AND SUSTAINABILITY FRAMEWORKS FOR WATER TREATMENT SYSTEMS.
DR. CORNEJO IS PASSIONATE ABOUT TEACHING AND INTERESTED IN INCREASING THE
PARTICIPATING OF UNDERREPRESENTED STUDENTS IN SCIENCE, TECHNOLOGY,
ENGINEERING AND MATHEMATIC FIELDS THROUGH INTERACTIVE, PROJECT BASED
SUSTAINABILITY EDUCATION.

HE IS ALSO A GREAT MUSICIAN.

AND DR. CORNEJO RECEIVED A BS IN CIVIL ENGINEERS WITH AN EMPHASIS ON WATER
RESOURCES AND ENVIRONMENT FROM THE UNIVERSITY OF COLORADO BOULDER.

HE RETAINED HIS MS AND PH.D. DEGREES IN ENVIRONMENTAL ENGINEERING FROM THE UNIVERSITY OF SOUTH FLORIDA AND CONDUCTED POST DOCTORAL RESEARCH AT THE UNIVERSITY OF COLORADO BOWLER.

WELCOME, DR. CORNEJO.

>> THANK YOU.

I AM TUNING IN FROM COLORADO AND BEFORE I START I WOULD LIKE TO BE MINDFUL THAT CHICO STATE STAND ON A LANDS THAT WERE ORIGINALLY OCCUPIED BY THE FIRST PEOPLE OF THIS AREA.

WE RECOGNIZE THE MASHUTAN AND THEIR RELATIONSHIP WITH THE WATERS AND THE LAND THAT ONE THROUGH OUR CAMPUS AND ARE ALSO HUMBLER THAT OUR CAMPUS RESIDES ON SECRET LANDS THAT WERE ONCE SUSTAINED BY THE PEOPLE FOR CENTURIES AND ACKNOWLEDGE THAT THEY ARE STILL DOING THEIR WORK.

TODAY WE ARE GOING TO BE TALKING ABOUT GRAND CHALLENGE ONE FROM A NATIONAL ACADEMIES OF SCIENCE ENGINEERING AND MEDICINE.

AND THAT CHALLENGE IS TO SUSTAINABLY SUPPLY FOOD, WATER AND ENERGY FOR THE 21ST CENTURY.

THIS CHALLENGE COMES FROM THEIR RECENT CONSENSUS STUDY REPORT AND DISCUSSES THE FACT THAT PROVIDING LIFE'S ESSENTIAL FOOD, WATER AND ENERGY FOR THE WORLD'S GROWING POPULATION IS A MAJOR CHALLENGE.

DOING SO IN A MANNER THAT DOES NOT THREATEN THE ENVIRONMENT AND THE HEALTH OR PRODUCTIVITY OF FUTURE GENERATIONS IS AN EVEN BIGGER CHALLENGE.

TO CONTEXTUALIZE THIS CHALLENGE, THE WORLD'S POPULATION IS GROWING AND URBANIZING, IN WHICH WE HAVE A LARGER POPULATION OF PEOPLE LIVING IN URBAN AREAS THAN RURAL AREAS.

ACCORDING TO THE UNITED NATIONS, THERE'S AN ESTIMATED 60% INCREASE IN FOOD PRODUCTION THAT WILL BE NEEDED TO FEED 9.3 BILLION PEOPLE BY THE YEAR 2050.

AND POPULATION GROWTH IS RELATED TO INCREASES IN WATER DEMAND.

ALL THE WHILE, CLIMATE CHANGE EXACERBATES PROBLEMS ASSOCIATED WITH WATER QUALITY AND WATER SCARCITY ESPECIALLY IN DROUGHT-PRONE AREAS.

ADDITIONALLY, GLOBALLY ENERGY DEMAND WILL INCREASE AS ONE IN SEVEN PEOPLE IN THE WORLD CURRENTLY LIVE WITHOUT ELECTRICITY.

THERE ARE EQUITY IMPLICATIONS ASSOCIATED WITH THIS GRAND CHALLENGE.

COMMUNITIES WORLDWIDE FACE CHALLENGES RELATED TO THEIR SUSTAINABLE SUPPLY OF FOOD, WATER AND ENERGY.

AND COVID-19 HAS EXACERBATED THESE CHALLENGES.

FOR EXAMPLE, DISRUPTIONS IN FOOD SUPPLY CHAIN CALL FOR A NEED FOR INNOVATIVE, RESILIENT AND LOCALIZED FOOD PRODUCTION THROUGH INNOVATIONS IN FARMING TECHNIQUES.

THIS IS ESPECIALLY TRUE IN BLACK, BROWN AND INDIGENOUS COMMUNITIES THAT FACE CHALLENGES IN BOTH URBAN AND RURAL SETTINGS.

EQUITY ISSUES ARE ALSO RELEVANT IN PLACES SUCH AS THE NAVAJO NATION IN WHICH THE PROVISION OF CLEAN WATER AND RENEWABLE ENERGY AND FOOD SUPPLIES ARE CRUCIAL.

COVID-19 HAS DISPROPORTIONATELY IMPACTED MANY INDIGENOUS COMMUNITIES. SO A LOT OF THE TALKS IN THIS SESSION WILL FOCUS ON OPPORTUNITIES TO BUILD RESILIENCE THROUGH INNOVATIVE TECHNIQUES AND ADDRESS THESE CHALLENGES.

WE ALSO HAVE SPEAKERS THAT WILL DISCUSS THE IMPORTANCE OF WASTE WATER TREATMENT, AND RESOURCE RECOVERY DURING THE GLOBE PANDEMIC.

THE GLOBAL PATHOGEN PROJECT, FOR EXAMPLE FOCUSES ON THE IMPORTANCE OF ACCESS TO SCIENTIFIC DATA TO ADDRESS WATER AND SANITATION ISSUES AND ANOTHER SPEAKER

WILL BE DISCUSSING THE IMPORTANCE OF RESEARCHING ANTIBIOTIC RESISTANCE IN THE FORM OF SUPER BUGS IN WASTE WATER STREAMS.

IN SUMMARY THE ENVIRONMENTAL ENGINEERING GRAND CHALLENGE NUMBER ONE HIGHLIGHTS THAT ADVANCING SUSTAINABLE AGRICULTURE TO FEED OUR GROWING POPULATION IS GOING TO BE NECESSARY.

INCREASING AGRICULTURE YIELDS AND REDUCING LIFE CYCLE ENVIRONMENTAL IMPACTS IS IMPORTANT.

ALSO ADDRESSING FOOD WASTE CHALLENGES IS IMPORTANT IN ADDITION TO ENVIRONMENTAL INJUSTICES AND CHALLENGES OF HUNGER.

OVERCOMING WATER SCARCITY IN TERMS OF IMPROVEMENTS TO SUPPLY AND EFFICIENCY ARE CRUCIAL AND CLEAN WATER AND CLEAN ENERGY ARE CRUCIAL FOR THIS CHALLENGE TO MEET INCREASES IN GLOBAL DEMAND.

WE CAN APPROACH THIS THROUGH SYSTEMS THINKING, LIFE CYCLE THINKING, RESOURCE RECOVERY BASED RESEARCH AND RESEARCH ON RESILIENT SYSTEMS TO IMPROVE GLOBAL OUTCOMES.

WITH THAT I WOULD LIKE TO INTRODUCE DR. WESLYNNE ASHTON.

DR. WESLYNNE ASHTON IS AN ASSOCIATE PROFESSOR AT THE ILLINOIS INSTITUTE OF TECHNOLOGY FROM THE STUART SCHOOL OF BUSINESS.

SHE STUDIES IN SOCIOECONOMIC SYSTEMS AND DEVELOPING ENVIRONMENTALLY RESPONSIBLE SOLUTIONS TO SOCIAL AND ENVIRONMENTAL CHALLENGES, PARTICULARLY IN LOW INCOME AND DEVELOPING REGIONS.

SO DR. ASHTON, WELCOME.

>> THANK YOU, PABLO.

TODAY I'M GOING TO BE TALKING ABOUT HOW LOCAL SUPPLY CHAINS CAN SUPPORT INNOVATIONS AND FOOD SUPPLIES AND DELIVERY.

NEXT SLIDE.

STATE CLOSED COVID-19 RESTRICTIONS COVID-19 CAUSED SEVERE DISRUPTIONS IN OUR FOOD SUPPLY CHAINS.

WHICH IS NOTABLY SEEN IN THING LIKE EMPTY GROCERY SHELVES AND SHUT RESTAURANTS.

BEHIND THE SCENES ON FARMS THERE WERE MIXED EFFECTS OF MY RESEARCH GROUP PIVOTED FROM OUR ACTIVITIES TO PARTICIPATE IN AN OUTREACH PROGRAM WITH ILLINOIS FARMERS TO UNDERSTAND COVID IMPACTS ON THEIR OPERATIONS.

SOME REPORTED BEING SEVERELY HANDICAPPED TO NOT BE ABLE TO SAFELY TEND AND HARVEST CROPS AND NOT BE ABLE TO ACCESS FACILITIES OR DISTRIBUTION CENTERS TO GET THEIR PRODUCTS TO CUSTOMERS OR MEET SAFETY REQUIREMENTS IN THOSE DISTRICTS CENTERS OR FARMER'S MARKETS.

BUT WE ALSO HEARD THAT BUSINESS HAD NEVER BEEN BETTER.

THAT DEMAND FOR LOCAL PRODUCE SKY ROCKETED.

AND IF THEY HAD, THE INFRASTRUCTURE AND RESOURCES TO GET PRODUCTS TO URBAN CONSUMERS THEY WERE ALMOST GUARANTEED HIGH SALES.

NEXT SLIDE.

EVEN BEFORE COVID, WE HAD BEGUN EXPLORING WAYS TO INCREASE SUSTAINABILITY AND EQUITY IN LOCAL FOOD SUPPLY CHAINS THROUGH INSTITUTIONAL PURCHASING AND BUSINESS MODELS FOR THE AGGREGATION OF PRODUCE FROM SMALL FARMERS.

THIS INCLUDED AN ANALYSIS OF FOOD HUBS ACROSS THE U.S. TO UNDERSTAND THEIR ORGANIZATIONAL STRUCTURES AND SERVICES OFFERED AND PROFITABILITY.

SINCE COVID WE HAVE BEEN INSPIRED BY THE DOZENS OF INNOVATIONS THAT HAVE EMERGED IN THE LOCAL FOOD SUPPLY CHAIN.

WHERE ALLIANCES OF SMALL FARMERS AND OPERATORS HAVE BEEN COLLABORATING TO SHARE RESOURCES TO LIVE ON NUTRITION FOODS ACROSS THE SPECTRUM.

I WOULD LIKE TO HIGHLIGHT TWO EXAMPLES OF CHICAGO.

ON THE LEFT IS A FARM WHICH IS A MEDIUM TECH FARM THAT GETS ITS NAME FROM RECYCLING 99.5% OF ITS WASTE.

IT PRIMARILY SERVED RESTAURANTS AND PIVOTED TO SELLING ONLINE PLATFORM AND THEY BROUGHT THEIR FRIEND ALONG.

SO NEIGHBORING FARMS AND OTHER FOOD PRODUCTION BUSINESSES OFFERING PICKUP AND DELIVERY ACROSS THE CITY, AND NEW VACATION SUCH AS THIS CLUB SHOWN HERE ON THIS PHOTO.

ON THE RIGHT IS A FRESH KITCHEN WITH A WORKER INCORPORATED WITH WORKER INDIVIDUALS WHO SPECIALIZE IN MEAL PREPARATION FOR BLACK AND BROWN COMMUNITIES.

THEY PARTNERED WITH LOCAL FARMS, OTHER FOOD SERVICE CO-OPS, AND COMMUNITY ORGANIZATIONS LIKE CHURCHES TO PROVIDE CULTURALLY APPROPRIATE MEALS TO FOOD INSECURE COMMUNITIES.

NEXT SLIDE.

MY GROUP STUDIES MATERIAL ENERGY AND WASTE FLOWS AND METRO DYNAMICS AND INDUSTRIAL ECOSYSTEMS WHICH EMBODIED THE CONCEPT OF AN CIRCULAR ECONOMY. EFFECTIVELY UTILIZING RESOURCES AND RECIRCULATING THEM AS MUCH AS POSSIBLE. WE ARE SEEING A NUMBER OF INITIATIVES LIKE THE PLANT PICKED HERE EMERGING ACROSS THE CITY.

COMBINING INK BASE FOR SUSTAINABLE AGRICULTURE, INCLUDING FARMING AND FOOD BUSINESSES WITH SYNERGIES ACROSS FIRMS TO USE BYPRODUCTS AND SHARED WATER RESOURCES AND DIGEST OF FOOD WASTE TO RECOVER ENERGY AND USE TO DIGEST AID AS AMENDMENTS.

THESE NEWER MODELS ARE ALSO PROPOSING HEALTH CENTERS INSIDE THEIR FACILITIES TO PROVIDE EDUCATION AND HEALTH SERVICES RELATED TO FOOD FOR THE COMMUNITIES IN WHICH THEY ARE LOCATED.

SUCH AS VEGGIE RX PROGRAM, WHERE DOCTORS PRESCRIBE VEGETABLES INSTEAD OF MEDICINES.

NEXT SLIDE.

AS WE DEVELOP NEW INNOVATIONS TO PRODUCE FOOD IN CITIES SUCH AS THROUGH CONTROLLED ENVIRONMENT AGRICULTURE, WE NEED TO BALANCE THE EMPHASIS ON TECHNOLOGICAL ADVANCES WITH CULTURAL NEEDS AND EQUITY CONCERNS IN THE PLACES WHERE THESE ENTERPRISES ARE DEVELOPING.

PICTURED HERE IN THE LEFT IS ARROW FARMS IN NEW JERSEY WHICH USES LEAFY GREENS GROWN IN VERTICAL STACKS THEY HAVE MANY BENEFITS, SUCH AS LOW WATER USE AND NO PESTICIDE USE.

BUT IT DOES HAVE SIGNIFICANT ENERGY CONSUMPTION CONCERNS.

IT REQUIRES TECHNOLOGY AND ROBOTICS BUT FEWER EMPLOYEES.

IT'S GETTING FUNDING WHICH IS IN CONTRAST TO THE UNDERINVESTED URBAN COMMUNITY IN WHICH MANY ARE LOCATED AND THE CAPITAL FLOWING TO BLACK AND BROWN ENTREPRENEURS WHO ARE INTERESTED IN STARTING SUCH BUSINESSES.

SO EQUITY AND FINANCING URBAN AGRICULTURE AT VARIOUS TECHNOLOGY LEVELS NEED TO BE ADDRESSED AS DOES CULTURAL APPROPRIATENESS OF OFFERINGS GROWN IN SUCH ENTERPRISES.

THE PHOTO ON THE RIGHT IS TAKEN AT A NEAR-BY SCHOOL WHERE ARREST FARMS IS TRYING TO GROW THEIR OWN FOOD AND SERVE TO KIDS IN THE CAFETERIA. MANY IN THE INDUSTRIALIZED FOOD CHAIN BUT IT HAS ALSO SHOWN THE POWER OF LOCAL FOOD PRODUCTION AND COLLABORATION FOR THE DELIVER -- DELIVERY OF DELICIOUS FOOD TO COMMUNITIES.

WHAT THEY ARE TRYING TO CREATE IS PRODUCTION AND CONSUMPTION AND WASTE MANAGEMENT TO ENSURE THAT BLACK, INDIGENOUS AND OTHER PEOPLE OF COLOR HAVE ACCESS -- NOT ONLY TO HEALTHY FOOD BUT ALSO BEING ABLE TO PROSPER FROM THE ECONOMIC OPPORTUNITIES TO PRODUCE IT.

THANK YOU.

BACK OVER TO YOU, PABLO.

>> THANK YOU VERY MUCH, DR. ASHTON.

OUR NEXT SPEAKER IS KARLETTA CHIEF.

SHE IS IN THE DEPARTMENT OF ENVIRONMENTAL SCIENCES IN THE UNIVERSITY ARIZONA IN TUCSON.

SHE IS THE DIRECTOR OF THE NATIONAL SCIENCE FOUNDATION NATIONAL RESEARCH TRAININGSHIP AND INDIGENOUS FOOD AND ENERGY AND WATER SECURITY AND SOVEREIGNTY.

HER RESEARCH GOAL IS TO IMPROVE OUR UNDERSTANDING, TOOLS, PREDICTIONS OF WATER, SHED HYDROLOGY, UNSATURATED FLOW IN AHEAD ENVIRONMENTS AND HOW NATURAL AND HUMAN DISTURBANCES AFFECT SOIL, HYDROLOGY THROUGH THE METRICS. DR. CHIEF IS THROUGH MESA, ARIZONA AND RECEIVED A BSF IN STANFORD, UNIVERSITY AND AS A NATIONAL SCIENCE FOUNDATION, THE DOCTOR RECEIVED HER PH.D. IN HYDROLOGY IN THE SCHOOL OF ENGINEERING AT THE UNIVERSITY OF ARIZONA.

SO WELCOME, DR. KARLETTA CHIEF.

>> THANK YOU CONVERGING COVID-19 HOSTS FOR INVITING ME TO THIS PANEL.

MY GRANDFATHER IS PATERNAL FLOATS AND INTO THE WATER.

THAT'S HOW I DESCRIBE MYSELF AS A NAVAJO WOLF.

I'M SPEAKING FROM THE UNIVERSITY OF ARIZONA WHICH IS LOCATED ON THE TRADITIONAL HOMELANDS OF THE APACHE, HOPI PEOPLE.

NEXT.

COVID-19 HAS AMPLIFIED FOOD, ENERGY AND WATER AND SECURITIES ACROSS THE WORLD AND DISPROPORTIONATELY AFFECTED AND IMPACTED INDIGENOUS COMMUNITIES.

NEXT.

IN THE UNITED STATES, COVID-19 IS RAMPANT ON THE NAVAJO NATION.

THE TRIBE IN THE UNITED STATES WHERE POVERTY RATES ARE MORE THAN TWICE THE STATE OF ARIZONA.

NAVAJO NATION STATE LACK OF FOOD AND WATER AS REASONS FOR THE PROLIFIC TRANSMISSION WHICH IN MAY 2020 RESULTED IN ONE OF THE HIGHEST COVID-19 INFECTION RATES IN THE UNITED STATES, THIRD ONLY TO NEW YORK AND NEW JERSEY.

NEXT.

IN THE UNITED STATES, NATIVE AMERICANS HAVE THE HIGHEST RATE OF DIABETES.

CORMORBIDITIES SUCH AS DIABETES AND CANCER ARE ON THE NATION.

NAVAJOS ARE AT RISK TO ENVIRONMENTAL EXPOSURE ON THE MINES.

UNREGULATED WATER SOURCES OFTEN USED FOR DRINKING WATER.

RESEARCH HAS LINK ARSINIC LADEN WATERS TO DIABETES.

FEW INSECURITIES HAVE BEEN LINKED TO THE NAVAJO NATION DURING THE PANDEMIC.

THE NAVAJO NATION HAS ONLY A FEW GROCERY STORES FOR A POPULATION OF NEARLY 200,000 TRIBAL CITIZENS.

THIS IS APPROXIMATELY EIGHT PEOPLE PER SQUARE MILE.

FURTHERMORE, 30% OF REMOTE DENE HOMES LACK RUNNING WATER AND 40% LACK ELECTRICITY.

THE DENE PEOPLE HAUL WATER FIVE TO 15 MILES AWAY AND INCURRING AN ENORMOUS EXPENSE OF 13.30 PER 100 GALLONS IN COMPARISON TO A NEAR-BY CITY OF 40 CENTS PER 100 GALLONS.

COMMUNITY RESILIENCE IS CRITICAL FOR DENE COMMUNITIES TO RESPOND TO AND RECOVER FROM PANDEMICS AND DISASTERS.

NEXT.

DEVELOPING TECHNICAL SOLUTIONS TO THESE CHALLENGES REQUIRES AN UNDERSTANDING OF INDIGENOUS SOCIETIES, GOVERNANCE AND CULTURE. AND THE ABILITY TO WORK EFFECTIVELY IN THESE CONTEXTS.

THUS, THE INDIGA-FEWS PROGRAM IS TO DEVELOP A DIVERSE WORKFORCE WITH ENTERTEASE IN SUSTAINABLE FOOD, ENERGY AND WATER SYSTEMS, SPECIFICALLY THROUGH THE DESIGN OF A FIT FOR PURPOSE WATER AND CONTROL AND ENVIRONMENTAL TECHNOLOGIES TO ADDRESS THE LACK OF SAFE WATER, ENERGY AND FOOD SECURITY IN INDIGENOUS COMMUNITIES TO DEVELOP THIS WORKFORCE, IN PARTNERSHIP WITH DENE COLLEGE OUR PROJECT OF INDIGENOUS FOOD AND WATER SECURITY OR INDIGI-FEWS IS ENGAGING COLLEGE STUDENTS WITH AN EMPHASIS ON FIRST GENERATION MINORITIES AND GRADUATING STUDENTS WITH AN INTEREST IN INDIGENOUS DEVELOPING COMMUNITIES.

NEXT, THE OVERALL RESEARCH THEME IS THE DEVELOPMENT OF A NOVEL AND SUSTAINABILITY SUSTAINABLE SOLUTION FOR OFFPERIOD PRODUCTION OF SAFE DRINKING WATER, BRIAN MANAGEMENT OPERATIONS AND CONTROLLED ENVIRONMENTAL AGRICULTURE SYSTEMS.

THIS INCLUDES RESEARCH AND HOLOGRAPHICS AND SENSOR CONTROLS AND GRAPHIC TECHNOLOGIES AND MATERIAL DEVICE AND SYSTEM RESILIENCY.

NEXT.

COMMUNITY RESILIENCE IS CRITICAL FOR DENE COMMUNITIES TO RESPOND AND RECOVER FROM.

PANDEMICS SUCH AS COVID-19.

RESILIENCE IS ABILITY TO MAINTAIN DESIRED STRUCTURE AND FUNCTION OF A FEW SOCIOECOLOGICAL SYSTEMS SUCH AS COVID-19.

YET OUTSIDE OF HEALTH METRICS FEW RESILIENT FRAMEWORKS OFTEN FAIL TO CONSIDER INDIGENOUS PERSPECTIVES.

EXISTING RESILIENCE FRAMEWORKS AIM TO CO-MANAGE RESOURCES AND EMPOWER INDIGENOUS PEOPLE, STILL REMAIN PART OF AN UNJUST AND COLONIAL SYSTEM, AND FAIL TO CONSIDER POLITICAL, SOCIAL AND CULTURAL PERSPECTIVES.

ENGAGE INDIGENOUS COMMUNITIES IS IMPORTANT TO INCREASING THE INDIGENOUS RESILIENCE WHICH MAY IMPROVE, FOR EXAMPLE SUSTAINABLE WATER RESOURCES AND MANAGEMENT AND FACILITATING ADDRESSING FEWS AND SECURITIES AMONG NATIVE AMERICAN COMMUNITIES.

FEW SECOND NOTHINGS CAN AUGMENT THE CAPACITY TO TRANSMIT TO DESIRE AND FUNCTION, THUS INCREASING AT A MULTI.

SCALE SUCH AS HOUSEHOLD, COMMUNITY AND TRIBAL NATION.

NEXT.

THANK YOU VERY MUCH.

>> THANK YOU SO MUCH, DR. KARLETTA CHIEF.

UP NEXT, OUR NEXT SPEAKER IS DR. MATT VERBYLA.

MATT VERBYLA IS AN ASSISTANT PROFESSOR OF ENVIRONMENTAL ENGINEERING AND DIRECTOR OF THE SAFE WATER RESEARCH LAB AT SAN DIEGO SATE UNIVERSITY SDSU. HIS RESEARCH TEACHING AND SERVICE ACTIVITIES ARE RELATED TO WATER AND WASTE WATER TREATMENT AND THE STUDY OF MICROBIOLOGY OF ENGINEERED AND NATURAL WATER SYSTEMS.

DR. VERBYLA HAS A BS IN CIVIL ENGINEERING FROM LAFAYETTE COLLEGE AND A MASTERS IN PH.D. IN ENVIRONMENTAL ENGINEERING FROM THE UNIVERSITY OF SOUTH FLORIDA.

WELCOME, DR. VERBYLA.

>> THANK YOU.

SO MY TALK TODAY IS ON PATHOGENS AND PARTITIONING IN RESOURCE RECOVERY SYSTEMS.

NEXT.

SO WASTE WATER TREATMENT SYSTEMS, WE KNOW TAKE SEWAGE AND PRODUCE A TREATED LIQUID EFFLUENT.

HOWEVER THEY ALSO CREATE SOMETHING NAMED SLUDGE AND WHEN HE WITH DO THE A TREATMENT SYSTEM OFTEN IT'S JUST THE REMOVAL OF SEWAGE AND TREATED WATER, THE LIQUID EFFLUENT.

HOWEVER, SOME PATHOGENS HAVE A GREATER ATTRACTION TO THE SLUDGE, AND IF WE WERE TO CONSIDER THE REMOVAL JUST FROM THE LIQUID PART AS IN THE DIFFERENCE BETWEEN THE SEWAGE AND THE LIQUID EFFLUENT COMPARE THAT TO THE OVERALL REDUCTION, WHICH IS THE DIFFERENCE BETWEEN THE SEWAGE COMING IN AND WHAT IS LEAVING IN THE LIQUIDS AND THE SOLIDS.

THE TWO CALCULATIONS WOULD PRODUCE DIFFERENT RESULTS.

NEXT.

SO WHAT CAUSES PATHOGENS TO BE MORE IN THE SLUDGE VERSUS MORE IN THE LIQUID?

SO SOME PATHOGENS HAVE A GREATER ATTRACTION TO SOLIDS.

THEY END UP MORE IN THE SLUDGE THAN THEY DO IN THE LIQUID.

AND CERTAIN TECHNOLOGIES HAVE THE NEED TO REMOVE SLUDGE MORE FREQUENTLY.

AND CERTAIN WASTE WATER TREATMENT TECHNOLOGIES ALSO PRODUCE DIFFERENT TYPES OF SLUDGE WITH DIFFERENT CHARACTERISTICS.

AND ALL OF THESE FACTORS EFFECT WHETHER OR NOT PATHOGENS END UP IN THE LIQUID EFFLUENT OR IN THE SLUDGE.

NEXT.

SO THIS IS RESULTS FROM A STUDY THAT OUR STUDENTS DID IN COLLABORATION WITH COLLEAGUE COLLEAGUES IN BRAZIL AT A RESEARCH AND TRAINING CENTER IN BELO HORIZONTE.

THIS WAS FOR TREATING WASTE WATER.

NEXT.

WE MEASURED THE CONCENTRATION OF VIRUS INDICATOR COLIPHAGE AT DIFFERENT POINT THROUGHOUT THIS TREATMENT AND FOUND THAT THEY HAD A LOW AFFINITY AND MOSTLY FOUND IN THE LIQUID EFFLUENT.

IN CONTRAST OTHER GROUPS HAVE REPORTED THAT SARS-COV-2, THE VIRUS THAT CAUSES COVID-19 HAS A HIGHER AFFINITY TO SOLIDS AND IS REGULARLY DETECTED AT HIGHER CONCENTRATIONS IN THE SLUDGE.

SO DEPENDING ON WHICH PATHOGEN IS OF INTEREST, THEY MIGHT BE MORE PREVALENT IN THE LIQUID EFFLUENT OR MAY BE MORE PREVALENT IN THE SLUDGE.

NEXT SLIDE.

SO WHY IS THIS IMPORTANT?

BECAUSE IN SOME PLACES THE SLUDGE IS ACTUALLY MORE VALUABLE TO FARMERS THAN THE LIQUID EFFLUENT IN TERSE OF RESOURCE RECOVERY AND USING THE RESOURCES AND WASTE WATER FOR FOOD PRODUCTION.

SO HERE'S AN EXAMPLE OF A PROJECT THAT WE HAVE IN COLLABORATION WITH THE NATIONAL WATER AND SEWAGE SYSTEMS FOR TREATMENT WHERE THE LIQUID EFFLUENT IS CHARGED TO THE RIVER AND NOT REUSED BUT THE SLUDGE IS USED TO REGROW CROPS IN THE REGION.

NEXT SLIDE.

SO OUR OBJECTIVE IS MANAGING THE SAFETY OF ENERGY AND FOOD WATER SYSTEMS IS TO OPEN UP ACCESS TO SCIENTIFIC DATA.

SO THE RESULTS PRESENTED PREVIOUSLY FROM OUR STUDY WOULD NORMALLY BE PUBLISHED IN A JOURNAL ARTICLE WHICH MAY ONLY BE ACCESSIBLE TO OTHER SCIENTISTS.

AND MAY BE -- YOU KNOW NOT OPEN ACCESS AND MAY REQUIRE A PAYMENT TO -- OR A LIBRARY SUBSCRIPTION TO OBTAIN THE DATA.

SO WHAT WE ARE DOING THROUGH THIS PROJECT IS PRODUCING A DATABASE THAT HAS ALL INFORMATION ABOUT WATER PATHOGENS THAT IS OPEN AND ACCESSIBLE FOR ANYONE TO USE.

AND ALONG WITH THAT DATABASE WE ARE PRODUCING A TOOL THAT PRACTITIONERS CAN USE TO CREATE MEANINGFUL OUTPUTS THAT CAN HELP THEM MAKE DECISIONS ABOUT RESOURCE RECOVERY AND SAFE REUSE OF WATER AND BIOSOLIDS FROM SLUDGE.

NEXT SLIDE.

SO THIS IS AN EXAMPLE OF THAT OUTPUT FOR THE SYSTEM IN UGANDA, WHERE THIS SYSTEM TREATS BOTH SEWAGE AND FECAL SLUDGE FROM SANITATION TECHNOLOGIES. AND THIS IS A CHART THAT SHOWS THE PREDICTION OF HOW VIRUSES FLOW THROUGH THE SYSTEM.

SO THE VIRUSES TEND TO END UP MORE IN THE LIQUID EFFLUENT RATHER THAN THE SLUDGE AND THE BIOSOLIDS.

NEXT SLIDE.

WHEREAS OTHER TYPES OF PATHOGENS LIKE HELMINTH EGGS, WHICH CAUSE DISEASES LIKE INTESTINAL PARASITES WILL TEND TO END UP MORE IN THE SLUDGE AND BIOSOLIDS. AND EVEN WITHIN THOSE PATHOGEN GROUPS THERE MAY BE DIFFERENCES FROM ONE TO ANOTHER, LIKE THE EXAMPLE OF VIRUSES.

SOME VIRUSES MAY TEND TO END UP MORE IN THE SLUDGE THAN OTHERS.

AND OTHERS MAY END UP MORE IN THE LIQUID.

AND WE WILL LOOK AT THE SLUDGE IT AS WELL.

SO HOW DOES THIS RELATE TO COVID-19?

SO SOME PATHOGENS ARE LARGER OR THEY HAVE OTHER PROPERTY WHICH MAKE THEM MORE LIKELY TO STICK OR HAVE AN AFFINITY TO THE SOLIDS SO SOME PATHOGENS MAY END UP MORE IN THE SOLIDS THAN THEY DO IN THE LIQUIDS AND SOME TREATMENT TECHNOLOGIES PRODUCE MORE SLUDGE THAN OTHERS.

COMBINED WITH THAT SLUDGE IS MORE VALUABLE THAN TREATED WASTE WATER IN SOME PLACES, AND THE OPPOSITE IS TRUE IN OTHER PLACES.

THE TREATED WASTE WATER MAY BE MORE VALUABLE THAN THE SLUDGE FOR RESOURCE RECOVERY.

IN TERMS OF COVID-19 AND THE USE OF WASTE WATER SURVEILLANCE, SARS COV-2 CONCENTRATIONS IN PRIMARY SLUDGE HAVE BEEN USED IN SEVERAL RESEARCH STUDIES THROUGHOUT THE WORLD AS THE BASIS FOR WASTE WATER BASED EPIDEMIOLOGY OR WASTE WATER SURVEILLANCE.

SO UNDERSTAND HOW PATHOGENS PARTITION BETWEEN LIQUID AND SOLIDS IS IMPORTANT FOR USING THESE TYPES OF METHODS.

NEXT SLIDE.

THAT'S ALL.

SO I WANT TO APPRECIATE THE CONTRIBUTIONS FROM OUR STUDENTS AND FROM OUR COLLEAGUES.

FOR THIS WORK.

>> THANK YOU VERY MUCH, DR. VERBYLA.

OUR NEXT SPEAKER IS DR. ANJALI MUCHANDANI IS IN THE WATER AND ENERGY EFFICIENCY FOR THE ENVIRONMENT LAB AT STANFORD UNIVERSITY.

ANJALI WILL BE JOINING THE UNIVERSITY OF NEW MEXICO AS AN ASSISTANT PROFESSOR IN 2021.

HER RESEARCH INVOLVES GLOBAL WATER, WASTE AND ENERGY CHALLENGES BY DEVELOPING NOVEL MATERIALS AND PHYSICAL CHEMICAL PROCESSES TO IMPROVE RESOURCE SUSTAINABILITY.

TWO UNIQUE RESOURCE RESERVOIRS SHE STUDIES ARE THE ATMOSPHERE.

CAPTURING AND DRINKING WATER FROM THE ATMOSPHERE AND SEWAGE SLUDGES, RECOVERING METALS, NUTRIENTS AND ENERGY.

SHE RECEIVED HER PH.D. AND MS IN ENVIRONMENTAL ENGINEERING FROM ARIZONA STATE UNIVERSITY AND BS IN CIVIL ENGINEERING FROM THE UNIVERSITY OF CALIFORNIA, LOS ANGELES.

WELCOME DR. MUCHANDANI.

>> THANK YOU VERY MUCH.

MY NAME IS ANJALI MUCHANDANI.

AND TODAY I WILL BE TALKING ABOUT ATMOSPHERIC WATER CAPTURE.

A DECENTRALIZED WATER SUPPLY.

NEXT SLIDE.

AS KARLETTA MENTIONED COVID-19 HIGHLIGHTED CHALLENGES IN RURAL AND REMOTE AREAS.

IN PARTICULAR THE NAVAJO NATION.

40% OF THE NAVAJO NATION DID NOT HAVE -- AS NOW WE NEED WATER FOR MORE THAN JUST WE NEED WATER FOR MORE THAN JUST DRINKING.

WE NEED IT FOR HAND SANITATION.

THIS CAN BE DIFFICULT AND EXPENSIVE DURING THE PANDEMIC.

THEREFORE THERE'S A NEED TO PROVIDE SAFE, CLEAN WATER OFF THE MUNICIPAL WATER GRID WITH THE FLEXIBILITY AND SAFETY OF BOTTLED WATER BUT WITHOUT THE ASSOCIATED COST AND WASTE.

NEXT SLIDE.

SO HOW DO WE GET WATER DURING THE PANDEMIC?

TYPICALLY WE THINK ABOUT OUR LIQUID WATER SUPPLIES LIKE RIVERS, LAKE, GROUND WATER.

BUT THESE SOURCES CAN BE INACCESSIBLE OR CONTAMINATED.

BUT THERE'S ANOTHER RESERVOIR THAT WE HAVEN'T TALKED ABOUT YET AND THAT'S THE ATMOSPHERE.

AND THE ATMOSPHERE ACTUALLY HAS SIX TIMES MORE WATER THAN RIVERS.

IT'S JUST STORED AS WATER VAPOR.

AND THE GREAT THING ABOUT THE ATMOSPHERE IS IT'S UNIVERSALLY PRESENT WE CAN ACCESS IT ANYWHERE AND AT TIME.

AN WATER CAPTURE WAS DESIGNED BY THE NAME OF DESERT BEETLE WHICH CAPTURES FOG ON ITS BACK TO SERVE AS A DRINKING SUPPLY.

NEXT SLIDE.

SO HOW DO WE AS HUMANS CAPTURE WATER FROM THE AIR IF ARE WITH NOT THE DESERT BEATLE.

WE USE DESICCANTS.

THEN WE CAN COOL, CONDENSE AND COLLECT THAT WATER AS A LIQUID.

AND DESICCANTS ARE TYPICALLY HOUSED IN A BOX SHOWN TO THE RIGHT.

ABOUT A CUBIC METER IN SIZE.

YOU CAN COLLECT WATER BY ABSORBING AND CONDENSING.

NEXT SLIDE.

SO HOW DO WE AS ENVIRONMENTAL ENGINEERS TAKE OUR SCIENTIFIC UNDERSTANDING OF DESICCANTS AND APPLY IT TO PROVIDE WATER TO THOSE IN NEED?

WELL WE CAN APPLY TOOLS IN OUR ARSENAL LIKE ATMOSPHERIC ACTIVE TOOLS AND EVENING THE SCIENCE AND ENGINEERING TOOLS.

IN THE UPPER LEFT I SHOW RELATIVE HUMANITY ACROSS THE UNITED STATES IN THE SUMMERTIME AND THE PURPLE BOX SHOWS THAT THE SOUTHWEST IS RELATIVELY ARID WITH HUMANITIES BETWEEN 10 AND 15%.

BUT THIS HAS ABUNDANT SUNSHINE WHICH CAN PROVIDE ENERGY FOR WATER ASH SOURCE WE HAVE BEEN ABLE TO USE IT FOR REGIONS AT 40% HUMIDITY WITH A ABUNDANT SUNSHINE.

THESE ARE SUPER HEATERS SO SIMILAR TO HOW YOU WOULD PARK A BLACK CAR OUT IN THE SUNSHINE IT WILL SUPER HEAT.

SO WE CAN SEE IN THE GRAPH IN THE BOTTOM RIGHT THAT THESE DESICCANTS WILL UPTAKE WATER AT 40% HUMIDITY AND QUICKLY RELEASE THAT WATER WHEN THEY ARE EXPOSED SO SUNSHINE.

AND WE CAN CYCLE THE MATERIALS BACK AND FORTH TO PRODUCE UP TO 2.5 METERS OF WATER PER SQUARE.

SO THIS IS ENOUGH FOR ONE OR MAYBE TWO PEOPLE'S DRINKING AND SANITATION SUPPLY. IMAGINE NOW IF WE CAN SCALE UP AND MODERNIZE THESE UNITS TO PROVIDE WATER AT A HOUSEHOLD OR EVEN AT A COMMUNITY SCALE.

NEXT SLIDE.

SO AS ENVIRONMENTAL ENGINEERS WERE ALSO CURIOUS ABOUT THE WATER THAT WAS PRODUCED.

IS IT SAFE FOR USE?

IS IT SAFE FOR US TO DRINK?

HERE WE SHOW AN EXAMPLE OF A WATER EQUAL PROFILE FOR DESIGNED ORGANIC CARBON.

AND YOU CAN SEE THAT THE CONCENTRATIONS VARY THROUGHOUT THE YEAR, DEPENDING ON YOUR LOCAL AIR QUALITY.

THEREFORE THE TYPE AND THE LEVEL OF TREATMENT THAT WILL BE REQUIRED, SUCH AS FILTRATION OR DISINFECTION IS GOING TO VARY BASED ON A LOCATION AND THE TIME OF YEAR THAT THESE SYSTEMS ARE GOING TO BE OPERATING.

NEXT SLIDE.

SO TO CONCLUDE AND TALK ABOUT THE CONVERGENCE OF ATMOSPHERIC WATER IN COVID-19.

MY MESSAGE IS WHILE WE FACE WATER SHORTAGE DURING THE DRAUGHTS AND DISASTERS, THERE ARE OPPORTUNITY TO LEVERAGE BETWEEN ENVIRONMENTAL ENGINEERS AND SCIENCE ENGINEERING FOR CREATIVE SOLUTIONS TO SUPPLY WATER TO ALL IN NEED.

NEXT SLIDE.

AND WITH THAT I WANT TO SAY THANK YOU FOR LISTENING TO MY TALK.

IF YOU ARE A STUDENT INTERESTED IN WORKING ON THESE TOPICS OR A FAMILIARITY OR INDUSTRY MEMBER INTERESTED IN COLLABORATING PLEASE REACH OUT TO ME AT ANJALI M.

THANK YOU.

>> THANK YOU, ANJALI.

UP NEXT WE HAVE DR. TALA NAVAB-DANESHMAND.

DR. NAVAB-DANESHMAND IS AN ASSISTANCE PROFESSOR OF CHEMICAL BIOLOGICAL AND ENVIRONMENTAL ENGINEERING AND ASSISTANT PROFESSOR, ENVIRONMENTAL ENGINEERING AT OREGON STATE UNIVERSITY.

DR. NAVAB-DANESHMAND RESEARCHES THE FATE IN TRANSMISSION PATHWAYS FOR PATHOGENIC AND ANTIBIOTIC RESISTED BACTERIA FROM WASTE WATER SYSTEMS TO ENVIRONMENTAL RESERVOIRS AS WELL AS THE DESIGN OF ENGINEERED SYSTEMS TO REDUCE AND COMBAT CONTAMINANTS OF EMERGING CONCERN.

DR. NAVAB-DANESHMAND WAS A POST DOCTORAL RESEARCHER IN SWITZERLAND AND A POST DOCTORAL FELLOW IN MONTREAL, CANADA, AND RECEIVE HER PH.D. IN ENVIRONMENTAL ENGINEERING FROM MCGILL UNIVERSITY IN MONTREAL, MS IN ENVIRONMENTAL ENGINEERING FROM TEHRAN UNIVERSITY AND A DEGREE IN CIVIL ENGINEERING -- BACHELORS OF CIVIL ENGINEERING FROM THE UNIVERSITY OF TECHNOLOGY IN TEHRAN.

WELCOME.

>> THANK YOU.

I AM GOING TO TALK ABOUT THE FOOD SECURITY AND FOOD SAFETY.

NEXT SLIDE, PLEASE.

WITH THE PREDICTION OF THE WORLD POPULATION TO REACH 10 BILLION BY 2050, THERE WILL BE AGRICULTURE DEMAND INCREASE AND THEREFORE AS DISCUSSED IN THIS PANEL, THERE WILL BE NEED FOR ALTERNATIVE RESOURCES IN AGRICULTURE IN TERMS OF IRRIGATION OR SOIL AMENDMENTS.

AND WASTE WATER CAN BE USED AS ALTERNATIVE RESOURCES.

THERE ARE REGULATIONS IN EFFECT.

BY DIFFERENT REGULATIONS AGENCIES FOR MICROBIOLOGICAL QUALITY, FOR REUSER WASTE WATER BIOSOLIDS IN AGRICULTURE.

IN THE U.S. THESE REGULATIONS ARE SET BY THE FOOD AND DRUG ADMINISTRATION AND ENVIRONMENTAL PROTECTION AGENCY.

IN TERMS OF BACTERIA SUCH AS E. COLI WHICH IS A FECAL INDICATOR BACTERIA.

WHAT THESE REGULATION DOES NOT INCLUDE ARE THE HUMAN HEALTH CRISIS OF ANTI-MICROBIAL RESISTANTS.

WHERE IT BECOMES RESISTANT TO NOT ONE BUT TWO BUT THREE CLASSES OF ANTIBIOTICS. THEY ARE SUPER BUGS.

FROM THE CDC REPORT THERE ARE ANNUALLY 2.8 MILLION ANNUAL ANTIMICROBIAL RESISTANCES CAUSING IT 35,000 DEATHS.

THE WIDESPREAD USE OF ANTIMICROBIAL THERAPIES IS REPORTED TO INCREASE IN SOME COUNTRIES AND THIS INCREASE IN ANTIBIOTIC TREATMENTS DURING THE COVID-19 PANDEMICS ARE GENERALLY DUE TO CO-INFECTIONS AND SECONDARY INFECTIONS. THEREFORE THE PANDEMIC HAS POTENTIALLY INCREASED THE BURDEN OF ANTIMICROBIAL.

THIS IS DUE TO HIGH POTENTIAL FOR TRANSMISSION OF PATHOGENS IN THESE COMMUNITIES.

>> ONE OF THE MAIN RESOURCES OF ANTIMICROBIAL RESISTANCE AND THEIR GENES.

NEXT, PLEASE.

THEREFORE ONE OF THE GAPS IN THE KNOWLEDGE THAT -- IN MY RESEARCH GROUP WE ARE TRYING TO ADDRESS ARE THE TIME VARIANTS OF ANTIBIOTIC RESISTANCE IN WASTE WATER.

SO HOW DOES IT CHANGE THE PREVALENCE AND PREVALENCE OF ANTIBIOTIC RESISTANCE IN GENES AND THEIR FAITH IN THE SOIL IN WASTE WATER AMENDMENT.

NEXT SLIDE, PLEASE.

TO ADDRESS THESE GAPS WE PERFORMED A STUDY IN A GREENHOUSE SETTING AT OREGON STATE UNIVERSITY WHERE WE HAD THESE TWO YOUNG POTS AND WE PLANTED CARROTS FROM SEEDS.

WE WATERED ONE GROUP -- SOME GROUPS WITH WATER AND SOME GROUPS WITH WASTE WATER.

WASTE WATER EFFLUENT.

WE ADDED SOIL AMENDMENT IN TERMS OF BIOSOLIDS TO SOME GROUP ASKS WE CONTINUED THE STUDY FOR 11 WEEKS UNTIL WE HARVESTED CARROTS.

DURING THIS TIME, WE COLLECTED WEEKLY SAMPLES OF SOIL, AND WE COLLECTED SAMPLES FROM THE WASTE WATER EFFLUENT AND CARRIED SAMPLES AND WE CARRIED THEM FOR THE ABUNDANCE OF WASTE WATER AND AGAIN.

YOU SEE THE GENES THAT WE LOOKING AT AND THE ON THE Y ACCESS THERE'S THE NORMALIZED CONCENTRATION OF THESE TARGET GENE, NORMALIZED TO RNA.

WE MEASURED THE CONCENTRATION OF THESE GENES AND THEN WE DID STATISTICAL ANALYSIS TO SEE WHETHER THERES WERE SIGNIFICANT TIME VARIANCES FOR THESE GENES DURING THE TEN WEEKS OF THE STUDY.

WE DIDN'T SEE A SIGNIFICANT TIME VARIANCE BETWEEN THESE GENES, MEANING THE CONCENTRATIONS REMAIN RELATIVELY CONSTANT THROUGHOUT THE TEN WEEKS. AND THESE TEN WEEKS WERE BETWEEN WINTER -- LATE WINTER AND EARLY SPRING IN OREGON WHERE THERE WAS A SIGNIFICANT TEMPERATURE CHANGE AND SIGNIFICANT CHANGE IN PRECIPITATION.

HOWEVER THOSE DID NOT IMPACT THE CONCENTRATIONS.

ON THE RIGHT-HAND SIDE YOU SEE CORRELATION MATRIX BETWEEN THE -- THE CORRELATION BETWEEN THE TARGET THE GENES THAT WE LOOKING AT.

THE RED BOXES ARE SHOWING CORRELATIONS HIGHLIGHTED BY STARS.

THERE ARE MANY CORRELATIONS.

THIS GENE WAS STRONGLY CORRELATED WITH THREE OF THE GENES WE TESTED AND LOOKED AT.

AND THESE THREE GENES, COULD -- BECAUSE OF THEIR CORRELATION WITH THIS MULTI-DROP RESISTANT GENES COULD ALSO SUGGEST BEING INDICATORS OF MULTIDRUG RESISTANT.

THESE POTENTIALLY CAN BE USED FOR FORMING POLICIES AND REGULATIONS FOR ANTIMICROBIAL RESISTANCE, BEING AN INDICATOR FOR POLICIES.

NEXT, PLEASE.

IN THIS FIGURE, YOU CAN SEE THE CONCENTRATIONS OF TOTAL ANTIBIOTIC RESISTANCE AND E. COLI, TOTAL ON THE TOP AND THE BOTTOM ONES ARE ANTIBIOTIC RESISTANT.

IT'S A CROWDED FIGURE BUT WHAT I WANT YOU TO TAKE FROM THIS FIGURE IS THAT IF YOU COULD -- IF YOU CAN SEE THEY ARE SO OVERLAPPING THAT YOU CAN'T SEE.

BUT WE HAVE WATER IRRIGATION AND WASTE WATER IRRIGATION IN SOLID AND IN DASH LINES.

AND THERE'S NO SIGNIFICANT DIFFERENCE -- THERE WAS NO SIGNIFICANT DIFFERENCE OBSERVED BETWEEN THE CONCENTRATIONS OF EITHER TOTAL OR ANTIBIOTIC RESISTANT TARGETED BACTERIA WHEN WE USE WASTE WATER IRRIGATION COMPARED TO WATER.

HOWEVER, WHEN WE APPLIED BY SOLIDS TO SOIL, THOSE ARE THE RED LINES WITH CIRCLE SYMBOLS, THE CONCENTRATIONS OF TOTAL ANTIBIOTIC RESISTANCE AND MICROBIAL INCREASED IN SOIL BUT INCREASED SIGNIFICANTLY.

BUT WHAT WAS INTERESTING WAS THAT THE ANTIBIOTIC RESISTANT BACTERIA DECLINED AT A SIGNIFICANTLY FASTER RATE THAN THE TOTAL COUNTERPART.

AND THAT'S GOOD NEWS SO THEY ARE NOT PERSISTING AS FOR AS THE TOTAL COUNTERPART.

HOWEVER WITH ITS MAJORITY OF MULTI-DRUG RESISTANT ENTEROCOCCI IN THESE.

WE SAW THE MAJORITY WERE RESISTANT TO IT.

NEXT SLIDE, PLEASE.

SO AT THE END I WOULD LIKE TO EMPHASIZE THAT ANTIMICROBIAL RESISTANCE CAN EXIST FROM THE PANDEMIC.

IT'S TO PROPORTIONATELY AFFECTING THE LOW AND MIDDLE INCOME COMMUNITIES.

WE NEED TO PAY SPECK FOCUS ON THIS CRISIS AND HOW IT EFFECTS DIFFERENT PRACTICES AND DIFFERENT POLICIES.

NEXT, PLEASE.

AT THE END I WOULD LIKE TO ACKNOWLEDGE CATHERINE MAYS, WHO WAS A GRADUATE STUDENT IN MY RESEARCH GROUP AND LED THE STUDIES WE JUST DISCUSSED AND MY COLLEAGUES AND U.S. DEPARTMENT OF AGRICULTURE FOR FUNDING THIS STUDY. THANK YOU.

>> THANK YOU SO MUCH TO ALL OF OUR PANELISTS I WOULD LIKE TO INVITE THE PANELISTS TO TURN ON THEIR CAMERAS FOR A Q&A. AND I WOULD LIKE TO ALSO INVITE ANY PEOPLE IN THE AUDIENCE TO SUBMIT QUESTIONS THAT Q&A AS THEY COME UP.

TO START THINGS OFF I WOULD LIKE TO JUST ASK A QUESTION TO ALL OF THE PANELISTS TO SEE IF YOU CAN SPEAK TO THE FOLLOWING:

WHAT ROLE DOES EQUITY PLAY IN YOUR RESEARCH AND TEACHING?

AND HOW DO YOU INCORPORATE EQUITY IN YOUR RESEARCH AND TEACHING?

SO WE CAN START WITH PERHAPS DR. CHIEF, TO SPEAK ON THIS TOPIC.

>> THANK YOU, DR. CORNEJO.

EQUITY IS CENTRAL AND DRIVING THE WORK THAT WE DO.

MUCH OF THE WORK THAT WE HAVE DONE HAS BEEN BUILT WITH THE COMMUNITY IN LISTENING TO THEIR CONCERNS.

DEVELOPING PARTNERSHIPS OVER MANY YEARS.

SO THE RESEARCH THAT WE DO DOESN'T HAPPEN ON OUR END ALONE.

WE REALLY WORK WITH THE NAVAJO NATION TO DIRECTION US AS TO WHAT ARE THE NEED AND CONCERNS THAT THEY HAVE.

IN ADDITION WE WORK WITH THE OLDEST TRIBAL COLLEGE IN THE UNITED STATES, DENE COLLEGE.

SO WHAT WE ARE DOING IS WE ARE BUILDING PATHWAYS TO SUPPORT THE TRIBAL COLLEGE STUDENT TO PURSUE EDUCATION AND CAREERS IN FOOD ENERGY WATER SYSTEMS.

BECAUSE THESE STUDENTS, THESE TRIBAL COLLEGE STUDENTS ARE STUDENTS THAT WANT TO WORK IN THEIR COMMUNITIES.

THEY WANT TO RETURN TO THEIR COMMUNITIES.

AND MANY OF THEM DON'T WANT TO LEAVE THEIR COMMUNITIES.

SO WE WANT TO WORK WITH THE TRIBAL COLLEGE TO PROVIDE THE TOOLS THAT THEY NEED SO THE STUDENTS CAN STAY WITHIN THEIR COMMUNITIES, SOLVE THE FOOD ENERGY WATER CHALLENGES WITHIN THEIR COMMUNITIES AND CO-DESIGN WITH THE COMMUNITIES.

SO THE COMMUNITIES IS REALLY DRIVING EVERYTHING THAT WE DO.

AND WE WORK WITH THE GRASS-ROOTS AND NONPROFIT ORGANIZATIONS AS WELL.

>> THANK YOU SO MUCH.

I WOULD LIKE TO DIRECT THIS NEXT QUESTION TO DR. WESLYNNE ASHTON.

I WOULD LIKE YOU TO TOUCH ON THIS ISSUE.

HOW YOU INTEGRATE EQUITY INTO YOUR RESEARCH AS WELL AS SPEAK ON RELATED TO THIS THEME OF CONVERGENCE, AND GIVEN WHAT THE OTHER PANELISTS HAVE TALKED ABOUT AFTER HEARING THE PRESENTATIONS, IN WHICH WAYS CAN WE MAKE OUR RESEARCH MORE EQUITABLE?

AND IN WHICH WAYS CAN WE MAKE OUR RESEARCH MORE CONVERGENT?

>> THANKS, DR. CORNEJO.

SO IN MY WORK, I ALWAYS TRY TO APPROACH FROM A POSITION OF HUMILITY.

SO I WORK PRIMARILY WITH BLACK AND BROWN COMMUNITIES IN CHICAGO, AND ECHOING PROFESSOR CHIEF'S COMMENTS, IT TAKES A LONG TIME TO BUILD RELATIONSHIPS WITH ORGANIZATIONS, WITH COMMUNITIES, TO GET THEM TO TRUST US.

THAT WE ARE NOT JUST USING THEM TO COLLECT DATA.

BUT INSTEAD ARE ABLE TO REALLY LISTEN TO WHAT THEIR NEED ARE, AND TO DIRECTION OUR RESEARCH IN A WAY THAT SUPPORTS THE THINGS THAT THEY NEED, AND THAT WE ARE ABLE TO WORK COLLABORATIVELY TO IDENTIFY WHAT ARE THEIR PRIORITIES. AND STRUCTURE OUR RESEARCH TO SERVE THOSE PRIORITIES.

NOW I THINK THAT -- IT WAS VERY INTERESTING LISTENING TO ALL OF THE PRESENTATIONS, RIGHT.

SO FOOD, ENERGY, WATER, ARE ALSO INTERCONNECTED.

AND THERE IS A THEME OF HEALTH, I THINK THAT ALSO THREADS THROUGH THE SEMINAR SERIES.

SO IT'S -- YOU KNOW HOW DO WE UTILIZE OUR RESOURCES MORE EFFECTIVELY.

AND SO HOW -- AS -- YOU KNOW AN ENGINEER BUT WORK IN BUSINESS AND DESIGN.

SO IT'S CONVERGING THAT TECHNICAL EXPERTISE AND UNDERSTANDING THAT AS WE DEVELOP NEW TECHNOLOGIES WE ALSO HAVE TO BE OPEN TO WORKING WITH OTHERS ON THE BEHAVIORAL SIDE AND UNDERSTANDING THE ECONOMICS OF THE TECHNICAL SOLUTIONS.

AND HOW -- YOU KNOW WE OFTEN THINK OF TECHNOLOGY AS NEUTRAL, RIGHT.

TECHNOLOGY IS NOT NEUTRAL.

SO EQUITY CONCERNS DO COME INTO HOW TECHNOLOGY IS BEING DEVELOPED AND WHO IS DEVELOPING THAT TECHNOLOGY.

SO I FEEL THAT -- YOU KNOW IN THINKING ABOUT CONVERGENCE WE NEED ENGINEERS. WE NEED ECONOMISTS.

WE NEED SOCIOLOGISTS AND WE NEED TO SEE WHAT HAVE YOU AS IS NEEDED.

>> I WOULD LIKE TO OPEN UP THE FLOOR TO OTHER PANELISTS TO WHAT ROLE DOES EQUITY AND TEACHING PLAY AND HOW CAN WE MAKE OUR RESEARCH MORE CONVERGENT, AFTER HEARING THE OTHER PRESENTATIONS AND PANELISTS.

>> I CAN TALK A LITTLE BIT ABOUT -- ONE THING WE ARE DOING HERE IN THE STATE WITH REGARD TO EQUITIES SO I'M WORKING WITH A GROUP TWO OTHER FACULTY IN OUR COMPARTMENT OF CIVIL ENGINEERING TO BRING RESEARCH INTO A SELF-STUDY. SO WHAT WE ARE DOING IS WORKING WITH A SOCIAL SCIENTIST AND GRADUATED ASSISTANT AND ANOTHER PROFESSOR WHO HAS DEVELOPED THIS TOOL TO CODE THE WAY THAT WE INTERACT WITH STUDENTS IN THE CLASSROOM.

SO WE HAVE OUR CLASSROOMS RECORDED WITH A CONSENT OF THE STUDENTS.

AND WE FOCUS ON WHICH STUDENTS PARTICIPATE IN THE CLASSROOM AND WHAT TYPES OF PARTICIPATION THEY -- YOU KNOW HOW THEY COMMUNICATE WITH US.

AND HOW WE RESPOND TO THEIR COMMUNICATION.

SO IT'S A WAY FOR US TO SEE THAT DATA AND FOR ME TO PERSONALLY UNDERSTAND HOW I CAN BETTER UNDERSTAND IMPLICIT BIASES THAT I HAVE WITH THE WAY I RESPOND TO STUDENTS AND STRUCTURE MY TEACHING TO ENGINEER THE SITUATION THAT ILLUSTRATES MORE EQUITABLE PARTICIPATING FROM STUDENTS.

SO THAT'S SOMETHING WE ARE DOING AT SDSU RELATED TO EQUITY IN THE CLASSROOM.

>> GREAT.

THANK YOU SO MUCH.

SO PERHAPS WE CAN GO TO ANOTHER QUESTION.

FEEL FREE TO ANSWER THE QUESTIONS RELATED TO EQUITABLE OUTCOMES AND ACHIEVING THOSE EQUITABLE OUTCOMES IN ADDITION TO HOW WE CAN MAKE OUR RESEARCH MORE CONVERGENT.

BUT WE HAVE A QUESTION FROM FERNANDO ROMAN WHO ASKS HIS QUESTION FROM TWITTER.

WHAT ARE SOME RECENT ADVANCEMENTS IN SUSTAINABLE TECHNOLOGY THAT YOU ARE PROUD OF?

AND THIS SEEMS LIKE IT MAY BE A GOOD QUESTION FOR ANJALI.

BUT WHOEVER WOULD LIKE TO TAKE IT IS WELCOME TO.

>> I'M EXCITED TO HAVE COMMUNITIES SERVE THEIR OWN WATER NEEDS AND SANITATION ON THEIR OWN.

THIS IS WHERE ATMOSPHERIC CAPTURE COMES IN.

NOT HAVING TO RELY ON LIQUID WATER SUPPLIES, UNDERSTANDING THAT THOSE CAN BE CONTAMINATED.

IT'S REALLY EXCITING FOR US TO SEE.

THAT AND SPEAKING TO THE IDEA OF EQUITY AND CONVERGENCE.

I'M REALLY EXCITED TO HEAR FROM PEOPLE LIKE KARLETTA AND WES, WHO SPEAK ABOUT THE COMMUNITIES AND WHO HAVE DONE WORK IN THE COMMUNITIES WHO UNDERSTAND THEIR NEEDS AND THINK ABOUT HOW THEY CAN THEN TIE THAT TO TECHNOLOGICAL SOLUTIONS TO PROVIDE INDEPENDENCE AND WATER CAPABILITY TO ALL.

>> GREAT.

THANK YOU SO MUCH.

PERHAPS DR. NAVAB-DANESHMAND CAN SPEAK TO THIS QUESTION OF BOTH EQUITY AND CONVERGENT RESEARCH BEFORE WE MOVE ON TO ANOTHER ONE.

>> SURE.

SO YOU KNOW, AS DISCUSSED -- FOR EXAMPLE WHEN WE TALKED ABOUT THE PROBLEM OF ANTIMICROBIAL RESISTANCE AND OTHER COMMUNITIES.

IT'S IMPORTANT TO LOOK AT THE COMMUNITIES AROUND US BUT THE COMMUNITIES THAT ARE DISPROPORTIONATELY AFFECTED BY THE PROBLEMS THAT WE STUDY.

AND IF WE ONLY FIND SOLUTIONS AND WE FIND THE -- WHATEVER GAPS IN THE KNOWLEDGE THAT WE ARE TRYING TO UNDERSTAND ANY ONE COMMUNITY THAT MIGHT NOT WORK NOR ALL COMMUNITIES AND IF WE HAVE A HOLISTIC APPROACH MEANING ALL COMMUNITIES ABOUT BUT ALSO A HOLISTIC APPROACH.

ENERGY.

HUMAN HEALTH AND ENGINEERING TO A HOLISTIC APPROACH TO FIND A SOLUTION, THAT WOULD GIVE US A MUCH BETTER SOLUTION THAT WOULD SERVE ALL AND WOULD CONSIDER ALL PARAMETERS.

>> WOULD LIKE TO CHIME IN, DR. CORNEJO.

I THINK ONE OF THE THINGS THAT WE ARE PROUD OF IN INDIG-FEWS WE ARE WORKING ON SYSTEMS WITH THE COMMUNITY.

SO IT'S A CO-DESIGN APPROACH THAT REQUIRES A LOT OF PROLIFERATION AND AT THE SAME TIME TRAINING OUR SCIENCE AND ENGINEERING STUDENTS TO HAVE CULTURAL AWARENESS, AND BE IMMERSSED IN THE COMMUNITY, TO UNDERSTAND WHAT THE PERSPECTIVES OF THE COMMUNITY ARE.

SO THEY ARE NOT JUST COMING IN, DOING HELICOPTER RESEARCH.

DESIGNING SOMETHING THAT WOULD NOT WORK WITH THE COMMUNITY.

AND SO PART OF THE SUCCESS OF THE TECHNOLOGY HAS TO BE ADOPTED BY THE COMMUNITY, WHICH MEANS THAT THE COMMUNITY HAS TO HAVE THE SKILLS TO OPERATE AND MAINTAIN THE SYSTEM.

SO WITH OUR TEAM, WE ARE WORKING WITH SOCIAL SCIENTISTS TO LOOK AT WHAT ARE THE PERCEPTIONS OF THE NAVAJO PEOPLE TO THESE SYSTEMS.

IS IT SOMETHING THEY WANT TO ADOPT AND MAINTAIN INTO THE FUTURE?

SO I THINK THAT'S REALLY CRITICAL IN THIS TECHNOLOGY INNOVATIONS, IS THAT WE ARE NOT JUST DESIGNING THE BEST AND THE GREATEST.

BUT REALLY IS THAT DESIGN GOING TO BE ADOPTED BY THE COMMUNITY?

AND WILL THEY BE ABLE TO OPERATE AND MAINTAIN IT INTO THE FUTURE?

SO IT'S REALLY ALSO WORKING WITH THE COMMUNITIES WORKFORCE AND DEVELOPING THEIR WORKFORCE TO ALSO ADOPT THIS.

AND ALSO STIMULATING THEIR ECONOMY AS WELL.

SO WE ARE TRYING TO IDENTIFY COMMUNITY PARTNERS WHO WOULD BE ABLE TO TAKE ON THESE TECHNOLOGIES, HELP IT TO CREATE MORE JOBS.

AND MAKE THAT TECHNOLOGY MORE AVAILABLE TO THE GREATER NAVAJO NATION.

THANK YOU.

>> ABSOLUTELY.

YES.

AND ONE THING THAT I WOULD ADD TO THAT IS THAT THIS LONG-TERM COMMITMENT TO SUSTAINABILITY, LONG-TERM COMMITMENT TO COMMUNITIES IS VERY IMPORTANT AT -- IN CONDUCTING RESEARCH HERE WITH DISENFRANCHISED COMMUNITIES IN THE UNITED STATES AS WELL AS COMMUNITIES ABROAD.

AND SOME OF THE INTERNATIONAL RESEARCH TO NOT JUST SWOOP IN AND THINK WE FIXED SOMETHING AND LEAVE, RIGHT.

BUT HAVE A TRUE LONG-TERM COMMITMENT.

I HAVE A QUESTION HERE RELATED TO COVID.

THIS IS A QUESTION THAT CAME IN FROM MUNAM MIR FROM G-MAIL.

HOW CAN WE USE OUR CURRENT CHANGES FROM LIFESTYLE AND DEMAND FROM COVID-19 TO REIMAGINE OUR SHIFT IN ENERGY SYSTEM AND CLEANER ENERGY MORE RESILIENT ENERGY SYSTEMS WHEN WE GO BACK TO LIFE UNDER -- YOU KNOW A LIFE WITHOUT COVID. I'M OPEN TO ANY INSIGHTS FROM ANY OF THE PLAN HE WILLISTS ON THAT IF YOU ARE INSPIRED.

>> I THINK FROM THE COMMUNITY.

IT'S REALLY REVITALIZED THE TRADITIONAL LIVELIHOODS THAT PEOPLE HAVE HAD SUCH AS RANCHING AND FARMING.

SO THOSE COMMUNITIES THAT HAVE REALLY HELD ON TO THAT ARE NOW THE ROLE MODELS FOR OUR COMMUNITIES.

AND THEY'VE HAD GOOD PRODUCE AND GOOD HARVEST AS A RESULT OF THIS REVITALIZATION.

AND I HOPE THAT IT WILL CONTINUE ON INTO THE FUTURE.

AND I THINK FOR THE INDIGENOUS COMMUNITIES THAT I WORK WITH, THEIR CONSERVATION PRACTICES HAVE BEEN AN EXAMPLE FOR US TO REDUCE OUR ENERGY USE, OUR CONSUMPTION.

SO I HOPE THAT HAS BEEN A WAKE-UP CALL FOR US TO BE MORE SUSTAINABLE LOCALLY. AND TO SUPPORT THOSE LOCAL COMMUNITIES IN THEIR SUSTAINABLE PRACTICES.

YOU KNOW WITHOUT THE PANDEMIC, THEY DIDN'T HAVE AS MUCH SUPPORT.

BUT NOW PEOPLE ARE LOOKING TO THEM, WANTING TO LEARN HOW TO DO SUSTAINABLE FARMING.

AND BE MORE SELF-SUFFICIENT.

THANK YOU.

>> I CAN ADD SOMETHING AS WELL.

I THINK THE IDEA OF DOING A CONFERENCE LIKE THIS, WE HAVE DEFINITELY REALIZED THAT THROUGH OUR WORK AND THROUGH OUR INTERACTIONS WITH OTHERS WE DON'T ALWAYS HAVE TO GO ON A PLANE AND GO SOMEWHERE.

WE CAN HAVE AN ACTIVE COMMUNICATION ALL OVER THE WORLD WITH THESE DIGITAL TOOLS TO REDUCE THE ENERGY AND CARBON FOOTPRINT OF OUR OWN ACTIVITIES I THINK IS AN IMPORTANT LESSON LEARNED FROM THIS PANDEMIC.

>> I WOULD LOVE TO ADD ON TO BOTH OF THESE COMMENTS.

I THINK WE NEED TO LOOK AT THE INSTITUTIONS AND POLICIES THAT CREATE THE DEMAND.

SO THINKING ABOUT ENERGY.

SO IN THE CITY -- THE CITY OF CHICAGO WE HAVE A NUMBER OF INITIATIVES THAT ARE THINKING ABOUT HAVING THESE SELF-SUFFICIENT INDUSTRIAL ECOSYSTEMS, TAKING FOOD WASTE.

DOING DIGESTION AND CONVERTING THAT INTO ENERGY.

BUT THEY ARE NOT ABLE TO SELL BACK TO THE GRID.

YOU KNOW THE COST OF INTEGRATING THAT TECHNOLOGY BACK INTO THE GRID IS SO HIGH THAT IT'S A REAL BARRIER.

SO I THINK THAT THERE NEED TO BE RECOGNITION FROM THE ESTABLISH THE INSTITUTIONS, WHETHER THAT IS THE ELECTRICITY SUPPLY COMPANIES.

IF WE ARE TALKING ABOUT FOOD, IT'S THE FOOD SUPPLY CHAIN AND THE INSTITUTIONS THAT DO LARGE PURCHASING, RECOGNIZING THE IMPORTANCE OF LOCAL GENERATION AND DIVERSIFYING THE SYSTEM TO PROVIDE SOME OF THAT RESILIENCE.

BUT I THINK WE ARE SEEING OPENINGS.

AND YOU KNOW INNOVATION IS HAPPENING ACROSS FOOD AND WATER.

BUT WE NEED FOR THEM TO THE INNOVATIONS TO TAKE HOLD AFTER THE PANDEMIC.

>> THANK YOU VERY MUCH.

I HAVE A QUESTION SPECIFICALLY FOR TALA.

I'M WONDERING ARE GREATER USE OF DISINFECTANTS FOR COVID-19 INCREASING MORE USE FOR ANTIBIOTICS?

>> THANKS FOR THE QUESTION:

THE USE OF DISINFECTANTS CERTAINLY INCREASES THE USE OF -- ON THE USE OF THE WATER SYSTEMS.

I'M NOT SURE OF THE USE INTO ANTIMICROBIAL TREATMENTS THEREFORE IT IS A GOOD QUESTION TO LOOK AT.

HOWEVER, I DON'T THINK THAT WOULD BE A SIGNIFICANT CONTRIBUTOR TO THE EMERGENCE OF ANTIBIOTIC RESISTANCE.

>> GREAT.

SO WE HAVE A GREAT DISCUSSION GOING ON HERE.

WE HAVE ABOUT 15 MORE MINUTES AND WE STILL HAVE SOME QUESTIONS COMING IN.

I HAVE A QUESTION HERE SPECIFICALLY FOR DR. ASHTON, AND THE GROUP IN GENERAL. WHOEVER WANTS TO ADDRESS THIS.

DO YOU THINK ANNOUNCEMENTS OF INVESTMENT INTO BLACK AND BROWN COMMUNITIES FOR HOMEOWNERSHIP SUCH AS BANK OF AMERICA AND CHASE HAVE THE ABILITY TO TRANSLATE TO ACADEMIC RELATIONS WITH ECONOMY IS AND ENGINEERS.

I THINK THIS SPEAKS TO ACADEMIC RESEARCH AND CONVERGING RESEARCH.

THIS IS A QUESTION FROM JOE BOSE.

>> I THINK WE HAVE TO BE INTENTIONAL ABOUT THE WORK WE DO DO THE RESEARCH.

SO IF WE ARE TALKING ABOUT THE CITING OF HE WAS WATER FACILITIES THAT ARE PRIMARILY IN PLACES OF COLOR AND LOW INCOME COMMUNITIES ACROSS THE WORLD, WE NEED TO CHALLENGE THE ASSUMPTIONS THAT THE TECHNOLOGIES WE ARE DESIGNING ARE NEUTRAL AND HAVE NEUTRAL IMPACT ON DIFFERENT COMMUNITIES.

SO I THINK THERE'S A REAL NEED TO BE MORE INTENTIONAL AND RECOGNIZE HOW OUR WORK CONTRIBUTES -- CONTRIBUTES TO RACISM OR IT CAN WORK TO DISMANTLE THAT SYSTEMIC RACISM.

SO I THINK IT'S SOMETHING WE DON'T ALWAYS CONFRONT IN OUR RESEARCH.

WHETHER IT'S SINGLE DISCIPLINARITY OR MULTI-DISCIPLINARITY.

I THINK HAVING IT ACROSS DISCIPLINES.

ESPECIALLY BRINGING IN ANTHROPOLOGISTS HELPS TO BRING THE INSIGHTS, RECOGNIZING WHAT ARE THE IMPACTS OF THE DESIGNS THAT WE ARE DEVELOPING GOING TO EFFECT DIFFERENT COMMUNITIES.

CREATE MORE HARM IN PARTICULAR REGIONS.

SO I THINK -- YOU KNOW THE CALL WAS REALLY FOR BEING MORE AWARE AND INTENTIONAL ABOUT HOW OUR WORKS CAN CONTRIBUTE TO RACISM.
A GUY WANTED TO JUST ALLOW FOR A LITTLE BIT OF ZOOM AWKWARD SILENCE TO SEE IF ANYONE ELSE WANTED TO CHIME IN THERE.
WE ARE ALL GETTING ACCUSTOMED TO.
THAT BUT I DID WANT TO ADDRESS A QUESTION FOR ANJALI.
SO THE COMMENT WAS FASCINATING MATERIAL DEVELOPMENT AND IDEA FOR USING ATMOSPHERIC WATER.
AT WHAT SCALE WOULD THERE HAVE AN IMPACT ON PRECIPITATION IN NEARBY AREAS? AND THIS IS A QUESTION FROM SHANNON CAPS.
>> THANK YOU SO MUCH FOR THAT QUESTION.
IT IS A VERY RELEVANT QUESTION.
IT REALLY COMES DOWN TO WHAT IS THE SCALE OF ATMOSPHERIC WATER CAPTURE THAT ARE YOU GOING TO PERFORM RELATIVE TO THE SCALE OR VOLUME OF WATER IN THE ATMOSPHERE.
AND BASED ON SOME OF OUR ANALYSIS WE FOUND THAT IF WE ARE DOING THIS AT A SMALL HOUSEHOLD OR LOCAL COMMUNITY SCALE, ARE YOU GOING TO BE COLLECTING LESS AND LESS THAN 1% OF THE TOTAL VOLUME OF WATER IN THE AIR.
SO OVERALL THERE SHOULD NOT BE A LARGE CLIMACTIC INFLUENCE.
HOWEVER IF WE DECIDED TO SCALE UP THE SYSTEMS TO BE LARGER AND PROVIDE WATER FOR EVERYBODY, THEN THERE WOULD BE AN ADDITIONAL NEED TO DO THAT FOR THE CLIMB.
DO I WANT TO TALK ABOUT EQUITY AND RESEARCH.
SO SOME OF THE THINGS WE ARE WORKING ON AT STANFORD ARE MAKING SURE THAT WE WORK ON INVITING SCHOLARS OF DIFFERENT BACK TO OUR RESEARCH GROUPS.
SO HOW CAN WE CREATE EQUITY IN THE PIPELINE OF STUDENT WHO ARE APPLYING?
SO ONE OF THE THING THAT WE ARE WORKING ON ARE OPEN COLLABORATIVE LAB RESOURCES THAT WE WILL BE ABLE TO PLACE ONLINE.
WORKING WITH STUDENT OF DIFFERENT BACKGROUND TO INCLUDE THEM IN OUR RESEARCH TO INCLUDE DIFFERENT PERSPECTIVES AND MAKING SURE THAT WE ARE PROVIDING OPPORTUNITIES TO EVERYBODY, TO INTERDISCIPLINARY COLLABORATE ON THESE TOPICS.
>> GREAT.
THANK YOU SO MUCH FOR THAT ANSWER.
I HAVE A QUESTION HERE RELATED TO COVID-19 AND THE CONNECTION BETWEEN OUTBREAKS AND MEAT PROCESSING PLANTS THAT WE HAVE SEEN.
SO WHAT HAVE WE LEARNED FROM COVID-19 OUTBREAKS IN MEAT PROCESSING PLANTS SPECIFICALLY THAT CAN BE PREVENTED, CHANGED IN FUTURE PANDEMIC?
I THINK PERHAPS THIS IS RELATED TO ANTIBIOTIC RESISTANTS, RELATED TO WASTE WATER IN ANIMAL FEED OPERATIONS AND THIS IS A QUESTION FROM HOPE.
THANK YOU, HOPE.
>> SO THE QUESTION WAS ABOUT -- SORRY I MISSED THE BEGINNING OF THE QUESTION.
>> THE QUESTION IS RELATED TO WHAT HAVE WE LEARNED ABOUT COVID-19 OUTBREAKS IN MEAT PROCESSING PLANTS -- YOU KNOW THAT HAVE BEEN CERTAIN CENTERS THAT HAVE HAD HIGH COVID-19 OUTBREAKS.
AND HOW MIGHT WE PREVENT OR CHANGE THIS IN FUTURE PANDEMIC?
>> THANK YOU.
THAT'S A VERY GOOD QUESTION.
AND THAT'S ONE OF THE MEAT PROCESSING PLANTS COULD BE ONE OF THE SOURCES THAT WE NEED TO LOOK AT FOR ANTIBIOTIC RESISTANCE.

AND IF IN FACT WE COULD HAVE -- WHAT WE DON'T WANT TO HAVE HAPPEN IS TO HAVE AN OUTBREAK OF SO-CALLED SUPER BUGS.

AND ONE OF THE PLACES FOR THIS TO HAPPEN COULD BE MEAT PLANTS AND ANIMAL FARMS.

SO THERE ARE MANY THINGS YOU CAN THINK ABOUT.

AND WE NEED TO FOCUS ON THE USE OF ANTIBIOTICS FOR --

FOR EXAMPLE FOR ANIMALS IN THEIR FEED BEING ONE OF THEM.

SO WE NEED TO REALLY FOCUS ON REGULATING THE PRESCRIPTION AND THE USE OF ANTIBIOTICS.

AND ANTIMICROBIALS.

WHETHER IT'S FOR ANIMAL FEED, AND FOR HUMANS AS WELL.

WE NEED TO REALLY FOCUS ON WHAT WE ARE DOING AND WHAT WE ARE CONSUMING TO AVOID THE FURTHER EMERGING THIS CONCERN.

>> I COULD ADD TO THAT TOO.

I THINK ANOTHER THING IN GENERAL THAT THE PUBLIC HAS LEARNED FROM THIS PANDEMIC IS THAT PATHOGENS DON'T NECESSARILY ONLY ORIGINATE FROM OTHER HUMANS.

SO THE KNOWLEDGE THAT THIS WAS A VIRUS THAT STARTED IN INFECTING BATS AND TRANSITIONED TO ANOTHER ANIMAL BEFORE IT EVOLVED -- MUTATED INTO SOMETHING THAT CAN INFECT HUMANS.

THE IDEA OF -- WHAT WE CALL ZOO-NOTIC PATHOGENS.

THAT IS SOMETHING THAT IS NOW PUBLIC KNOWLEDGE.

SO IT'S IMPORTANT WE MANAGE FOOD, ENERGY AND WATER SYSTEMS USING A ONE HEALTH PERSPECTIVE WHERE WE ARE NOT JUST THINKING ABOUT HUMAN WASTE AS A POTENTIAL HAZARD BUT ALSO ANIMAL WASTE.

>> ABSOLUTELY, YEAH.

I THINK THAT'S IMPORTANT FOR MANY DIFFERENT CONCENTRATED ANIMAL FEED OPERATIONS, FOR EXAMPLE, IN THE U.S. AS WELL AS SMALLER SCALE SYSTEMS.

THIS IS A QUESTION FOR DR. ASHTON.

I ALSO THINK THAT DR. CHIEF MIGHT BE ABLE TO ADDRESS THIS ISSUE.

SOME AREAS HAVE BEGUN TO SHIFT TO MORE LOCALIZED FOOD SUPPLY CHAINS BECAUSE OF VULNERABILITIES EXPOSED BY THE PANDEMIC.

THE QUESTION IS DO YOU BELIEVE THIS WILL LAST THROUGH AND BEYOND THE END OF THE PANDEMIC?

AND I LIKE THIS BECAUSE I THINK IT ADDRESSES THE IMPORTANCE OF LOCALIZED FOOD SUPPLIES TO ADDRESS THE PROVISION OF HEALTHY FOODS FOR COMMUNITIES.

SO ANY COMMENTS ON THAT WOULD BE FANTASTIC.

>> I WAS ALSO THINKING ABOUT ADDRESSING THE MEAT PROCESSING QUESTION, BUT FROM THE ECONOMIC SIDE.

BECAUSE WHAT WE SEE HERE -- AND IT RELATES TO THIS QUESTION, IS THAT -- YOU KNOW WE HAVE HAD A HIGHLY EFFICIENT INDUSTRIALIZED FOOD SUPPLY CHAIN.

BUT WHAT THAT INCLUDES ARE CHOKE POINT ALONG THIS SUPPLY CHAIN.

SO THE MEAT PROCESSING PLANTS ARE A KEY PART OF THAT.

SO WE HAD FARMERS WHO HAD TO KILL THE PIGS -- YOU KNOW.

KILL ANIMALS ON THEIR FARMS BECAUSE THE BACKLOG TO GET INTO THE MEAT PROCESSING PLANTS BECAUSE OF COVID WAS RUNNING INTO MONTHS.

SO THERE WAS A BOTTLENECK AND HIGH DEMAND AT THE MEAT PROCESSING PLANTS TO PROCESS ANIMALS INTO MEAT.

AND I THINK -- SO THERE ARE SIMILARITIES IN OTHER PARTS OF THE FOOD SUPPLY CHAIN. THERE IS A SIGNIFICANT PUSH AMONGST LOCAL SUPPLIERS.

THAT INCLUDES FARMERS.

IT INCLUDES POLICY ADVOCATES.

TO BUILD UPON THE RELATIONSHIPS AND THE INNOVATIONS THAT HAVE EMERGED IN RESPONSE TO COVID.

AND I THINK THAT THERE IS A REAL FEAR THAT BECAUSE WE HAVE SUCH HIGH EFFICIENCY AND LOW COST IN THE CONVENTIONAL SUPPLY CHAIN, THAT IT'S GOING TO BE VERY EASY TO SWITCH BACK INTO THAT MOULD.

SO RIGHT NOW WE SEE CUSTOMERS DEMANDING MORE LOCAL FOOD.

YOU KNOW BECAUSE IT'S AVAILABLE.

AND IN A WAY THAT DURING THE HIGH OF THE PANDEMIC SUPPLY CHAINS WERE DISRUPTED.

I THINK WE NEED TO -- ONE, SORT OF WORK WITH CONSUMERS.

YOU KNOW, TRY TO BUILD AND ENCOURAGE CONSUMERS TO CONSUMING AND DEMANDING FOOD THAT IS PRODUCED LOCALLY.

THERE'S ALSO A NEED TO INSTITUTIONALIZE CONTRACTS.

SO WHETHER THAT IS WITH ORGANIZATIONS LIKE PUBLIC SCHOOLS OR --

YOU KNOW GOVERNMENT AGENCIES WHO HAVE A LARGE DEMAND.

UNIVERSITIES THAT CAN PROVIDE THE DEMAND FOR LOCAL FOOD PRODUCERS TO CONTINUE THAT RELATIONSHIP.

SO IT'S NOT JUST A ONE-TIME THING.

AND FINALLY I THINK THERE ARE POLICY SHIFTS.

SO I THINK TO MY EARLIER POINT THERE'S A NEED FOR INSTITUTIONAL CHANGE, STRUCTURAL CHANGE, POLICY CHANGE THAT CAN KEEP THE DEMAND FOR THAT MORE LOCAL, MORE DIVERSIFIED FOOD PRODUCTION AND SUPPLY TO HELP CONTINUE THESE POSITIVE TRENDS THAT WE HAVE SEEN.

>> I ANY IT WOULD BE EASY FOR US TO FORGET IF THE PANDEMIC EVER ENDS -- IF IT WERE TO BE IN THAT NEW NORMAL, I THINK IT WOULD BE EASY FOR US TO REVERT BACK.

AND I AGREE WITH DR. ASHTON THAT THERE NEED TO BE THE STRUCTURAL CHANGE AND THE POLICY CHANGE.

BUT I ALSO AGREE WITH DR. VERBYLA THAT IN THIS VIRTUAL WORLD THERE HAS BEEN CONNECTIONS MADE WITH INDUSTRY TO CONNECT WITH NAVAJO CHAPTER GOVERNMENTS TO BE INNOVATIVE AND THINK ABOUT CONTRIBUTING TO THE ECONOMY OF THE LOCAL CHAPTER COMMUNITY TO LOOK INTO VERTICAL FARMS IN WAYS THAT CANNOT ONLY STIMULATE THE LOCAL ECONOMY, BUT ALSO SUPPLY FOOD TO THE LOCAL FOOD CHAINS IN THESE VARIOUS GROCERY MARKETS.

WE HAVE INDIVIDUAL FARMERS, NONPROFITS THAT HAVE BEEN DOING LOCAL TRADITIONAL FARMING FOR MANY YEARS.

AND IT'S HARD WORK.

ESPECIALLY WITH DRY LAND FARMING, WHERE YOU'RE NOT CONNECTED TO IRRIGATION SYSTEMS.

SO IN ORDER FOR THOSE TRADITIONAL FARMERS TO CONTINUE, I THINK THEY NEED THAT TYPE OF SUPPORT FROM POLICIES, GRANTS.

OTHER WAYS TO ALLOW THEM TO CONTINUE DOING THAT TYPE OF TRADITIONAL FARMING. AND THEN PASSING IT ON TO THEIR CHILDREN.

BECAUSE I THINK THAT'S WHERE THERE'S A DISCONNECT AT TIMES WITH OUR COMMUNITIES, THAT YOU KNOW MANY OF THE YOUNG PEOPLE ARE OUT -- YOU KNOW IN URBAN SETTINGS.

BEING MODERN.

AND THEY ARE NOT AT HOME ENGAGING IN THAT TRADITIONAL TYPE OF FARMING.

SO THERE'S A LOT OF DIFFERENT LEVELS THAT NEED TO COME TOGETHER TO REALLY MAKE THAT SIGNIFICANT CHANGE.

AND I HOPE THAT WE CAN DO THAT NOW, WORK ON THAT NOW WHILE WE ARE IN THIS PHASE AND HOPE THAT THAT WILL BE PART OF THE MEMORY -- YOU KNOW, A PERMANENT CHANGE.

AND THAT WE WON'T FORGET ONCE WE GO BACK TO THE NEW NORMAL.

AND THAT'S WHAT I REALLY HOPE FOR.

>> THANK YOU SO MUCH.

AND I THINK THAT -- YOU KNOW NOT ONLY RESILIENT FOOD SYSTEMS.

IN ADDITION A LOT OF SMALL COMMUNITY, DECENTRALIZED COMMUNITIES FACE MANY CHALLENGES ON THE WASTE WATERFRONT.

AGING INFRASTRUCTURE CHALLENGES, AND A NEED TO INNOVATE AND MAKE DECISIONS FROM AN ENVIRONMENTAL AND ECONOMIC PERSPECTIVE IN WASTE WATER MANAGEMENT, RESOURCE RECOVERY AND DRINKING WATER PROVISION AS WELL AS SUSTAINABLE ENERGY SOURCES.

I THINK WE HAVE TIME FOR ONE MORE QUICK QUESTION.

AND THEN WE WILL WRAP THINGS UP.

I BELIEVE THIS QUESTION IS FOR ANJALI.

IT'S A QUESTION ON TWITTER FROM COLLEEN.

BESIDES DISSOLVE ORGANIC CARBON IN THE ATMOSPHERIC WATER CAPTURE, ARE THERE ISSUES WITH MERCURY OR OTHER CHEMICAL COMPOUNDS?

SIMILAR ISSUES AS -- YOU KNOW THING YOU WOULD FACE WITH ACID RAIN, FOR EXAMPLE.

>> THAT'S A REALLY GOOD QUESTION.

SO WE HAVE TESTED VARIOUS TYPES OF ATMOSPHERIC WATER CAPTURE DEVICES.

THOSE THAT ARE DESICCANT BASED AND THOSE THAT ARE REFRIGERATED BASED AND WE FIND THE TYPE OF TECHNOLOGY IMPACTS THE QUALITY OF THE WATER THAT IS PRODUCED.

SO YOU WHEN YOU USE A DESICCANT BASED SYSTEM WE HAVE MEASURED 27 DIFFERENT ENVIRONMENTAL VETTELs PRIMARILY BY THE PRIMARY AND SECONDARY DRINKING WATER LIMITS AND WE FIND THEY ARE WELL BELOW THE LEVELS FOR DESICCANT SYSTEMS.

HOWEVER WHEN YOU USE A SIMPLE CONDENSER BASE SYSTEM WHERE YOU ARE JUST COLLECTING THAT WATER VAPOR AND CONDENSING IT TO A LIQUID YOU DO SEE VARIOUS METALS FROM THE WATER THAT ARE BEING COLLECTED IN THE ATMOSPHERIC AIR.

SO MY ANSWER TO THAT WOULD BE THE TYPE OF TECHNOLOGY YOU USE AND WHERE YOU IMPLEMENTED IT WILL IMPACT THE LEVEL OF TREATMENT THAT IS REQUIRED FOR A SPECIFIC USE CASE SCENARIO.

THERE'S NO ONE SIDE FITS ALL SOLUTION.

THANK YOU.

>> ABSOLUTELY.

SO HOW DO WE MOVE TOWARDS MORE FIT FOR PURPOSE SYSTEMS?

HOW DO WE USE TOWARDS MORE APPROPRIATE TECHNOLOGIES FOR OUR FOOD, WATER AND ENERGY SYSTEMS IN RURAL COMMUNITIES, IN URBAN COMMUNITIES, GLOBALLY, LOCALLY.

HOW DO WE MOVE TOWARDS MORE EQUITABLE SOLUTIONS.

I WOULD LIKE TO THANK EVERYBODY FOR COMING TO THIS SESSION.

WE DO HAVE SOME BRIEF ANNOUNCEMENTS ABOUT UPCOMING SESSIONS RIGHT AFTER THIS.

BUT IN SUMMARY THIS WAS A SESSION ABOUT THE SUSTAINABLE SUPPLY OF FOOD, WATER AND ENERGY.

WE HAD A GREAT LIST OF SPEAKERS FROM AROUND THE COUNTRY THAT JOINED IN.

AND PANELISTS TO TALK ABOUT THEIR RESPECTIVE RESEARCHERS.

SO I WOULD LIKE TO THANK DR. WESLYNNE ASHTON, DR. KARLETTA CHIEF, DR. NAVAB-DANESHMAND AND DR. MUCHANDANI AND DR. VERBYLA FOR BEING PANELISTS AND I

WOULD LIKE TO THANK EVERYBODY ON YOUTUBE AND ZOOM FOR TUNING IN AND I WOULD LIKE TO HAND THE.

>> MIKE: OVER TO MAYA FOR ANNOUNCEMENTS ON FUTURE SESSIONS.

>> THANK YOU, PABLO AND EVERYONE.

THAT WAS AN EXCELLENT SESSION.

I THINK WE GOT THROUGH QUITE A BIT F Q&A SO THANKS TO FOLKS WHO HAVE SENT IN QUESTIONS.

WE WILL BE POSTING THE Q&A ON THE AEESP CONVERGING COVID-19 SITE.

THIS IS THE FIRST SESSION THAT ACTUALLY GOT THROUGH MOST OF THE QUESTIONS AND ANSWERED ONLINE ALSO.

WE DO HAVE A QUIZ THAT GOES WITH THIS SESSION.

YOU CAN CLICK ON THE QR --

TAKE A PICTURE OF THE QR CODE THERE OR FIND IT ALSO ON THE AEESP CONVERGING COVID-19 WEBSITE YOU DO GET CONVERGING CREDITS FOR ATTENDING THESE SESSIONS.

AND I WOULD JUST LIKE TO SAY COMING UP NEXT WEEK WE HAVE COVID-19 IN DESIGNING A FUTURE WITHOUT POLLUTION AND WASTE.

I KNOW THERE WERE QUESTIONS ON ENERGY THAT I THINK SOME ARE GOING TO BE ANSWERED NEXT WEEK.

AND JUST TO WRAP UP AND SAY REALLY THANK YOU TO THE SPONSORS AND THE ORGANIZATIONS INVOLVED HERE.

A BIG SHOUTOUT TO THE STRONG PROGRAM.

I SEE SOME ADVISORY BOARD MEMBERS ARE PARTICIPATING, INCLUDING SOME OF OUR PARTNERS FROM THE BARBADOS WATER AUTHORITY.

THE NATIONAL SCIENCE FOUNDATION, AEESP, OF COURSE USF AND UNIVERSITY OF CALIFORNIA MERCED.

AND THE COHORT OF STAFF AND STUDENTS FROM BOTH INSTITUTIONS WHO HAVE MADE THIS A SUCCESS.

SO THANK YOU AGAIN TO THOSE LOGGING ON, AND TO OUR AMAZING PANELISTS.

YOU GUYS ARE SO EFFICIENT.

AND I REALLY HOME WE CAN CARRY ON THESE CONVERSATIONS, ESPECIALLY SINCE THERE'S SO MUCH INTEREST IN WORKING IN THE PLACES, IN THE COMMUNITIES WITH WHOM YOU WORK.

THANK YOU SO MUCH.