



NUST ANNUAL SDGs REPORT 2019







1.0

NUST SDGs-Engagement Plan 2018-19

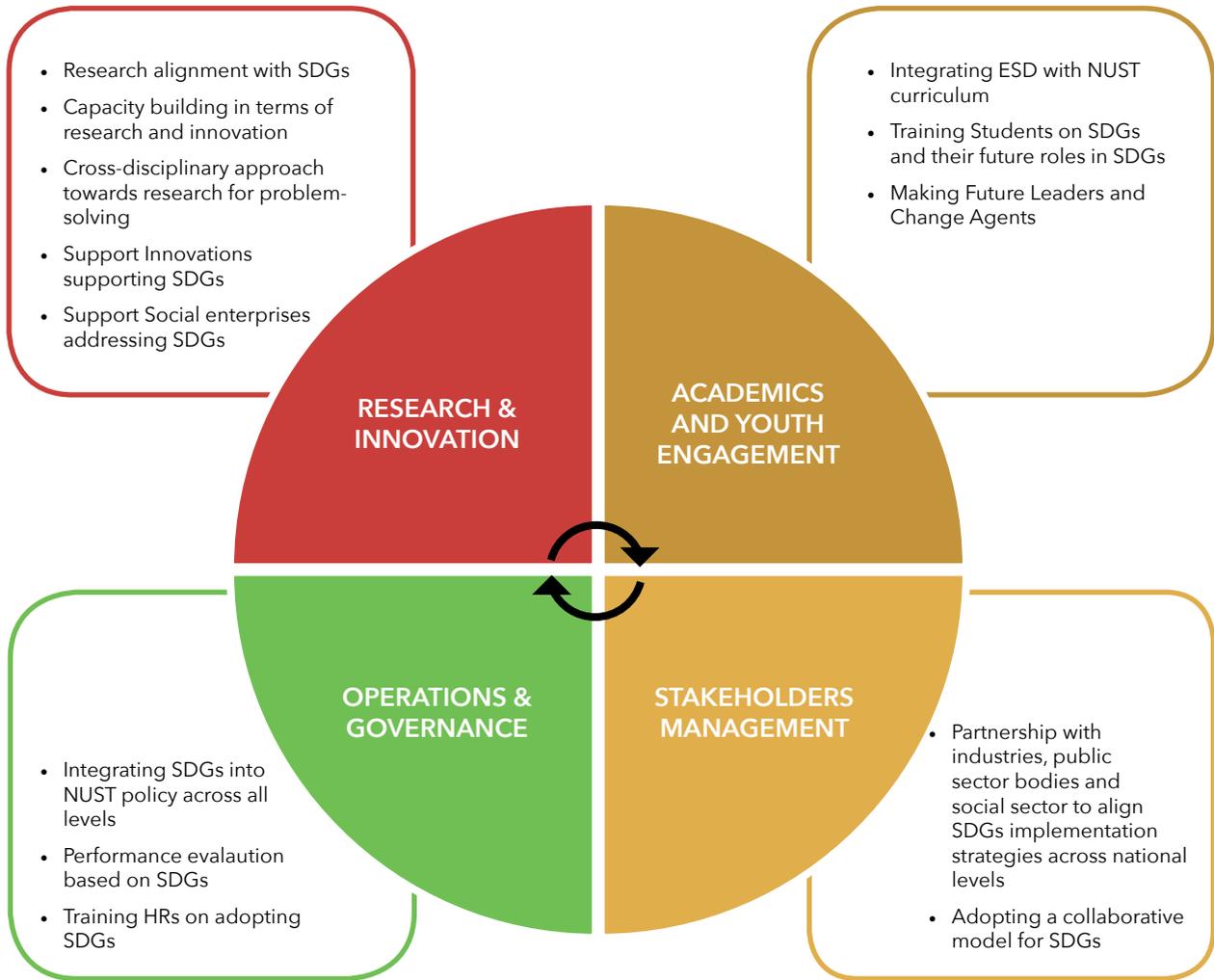
NUST embarked upon the journey of SDGs engagement with one core mission in hand: “map, align, measure, restructure, redesign, monitor and collaborate”. NUST initiated the SDGs Engagement Programme in 2018 and so far has achieved remarkable progress in doing so that has been appreciated both at home and internationally, having been duly acknowledged. We continue our upward journey towards greater adoption of SDGs in all of our core functions.

UN SDGs is a universal, comprehensive, and inclusive framework for development which addresses the needs of all forms of life existing on this planet. With 17 goals, 169 targets, and 232 indicators included in the Development Agenda 2030, UN SDGs provide an elaborated masterplan for all the organizations to adopt sustainability as the key element in their long-term strategy.

Pakistan being initial signatory of UN SDGs, is obliged to meet the Agenda 2030 and report annually on its progress to the United Nations. In order to fulfill that obligation, organizations especially HEIs must make SDGs an integral part of their strategy to assist in achieving the national commitment.



Realizing the importance of UN SDGs, NUST has adopted the requisite framework to become what is termed internationally as a “SDGs-engaged University”. NUST also strategically aligned all of the following university core functions with UN SDGs:



NUST also submitted SDGs related credentials in internationally claimed Times Higher Education (THE) Impact Ranking for 2019 and 2020.



1.1

THE IMPACT RANKINGS

2020: 860+ Universities Participated Globally

Global: NUST Ranked Overall 200-300, Top 100 in SDG 4 and SDG 12

NUST participated in all 17 SDGs in 2020 THE Impact Rankings and was ranked between 200-300 globally.

SDG	World Rank 2019	World Rank 2020	Domestic Rank 2020	Remarks
SDG 1: No Poverty		201-300	3 rd	Ranked 1st Time
SDG 2: Zero Hunger		201+	3 rd	Ranked 1st Time
SDG 3: Good Health and Well being		401-600	4 th	Ranked 1st Time
SDG 4: Quality Education	101-200	70	1 st	Improved
SDG 5: Gender Equality	201-300	201-300	3 rd	Remained Same
SDG 6: Clean Water and Sanitation		201-300	3 rd	Ranked 1st Time
SDG 7: Affordable and Clean Energy		101-200	2 nd	Ranked 1st Time
SDG 8: Decent Work and Economic Growth		101-200	2 nd	Ranked 1st Time
SDG 9: Industry, Innovation and Infrastructure	101-200	101-200	1 st	Remained Same
SDG 10: Reduced Inequalities		301-400	2 nd	Ranked 1st Time
SDG 11: Sustainable Cities and Communities		301-400	2 nd	Ranked 1st Time
SDG 12: Responsible Consumption and Production		78	1 st	Ranked 1st Time
SDG 13: Climate Action		301+	4 th	Ranked 1st Time
SDG 14: Life below Water		201+	2 nd	Ranked 1st Time
SDG 15: Life on Land		201+	2 nd	Ranked 1st Time
SDG 16: Peace, Justice and Strong Institutions		301-400	2 nd	Ranked 1st Time
SDG 17: Partnership for the Goals	300+	101-200	1 st	Improved
Overall	300+	201-300	2 nd	Improved



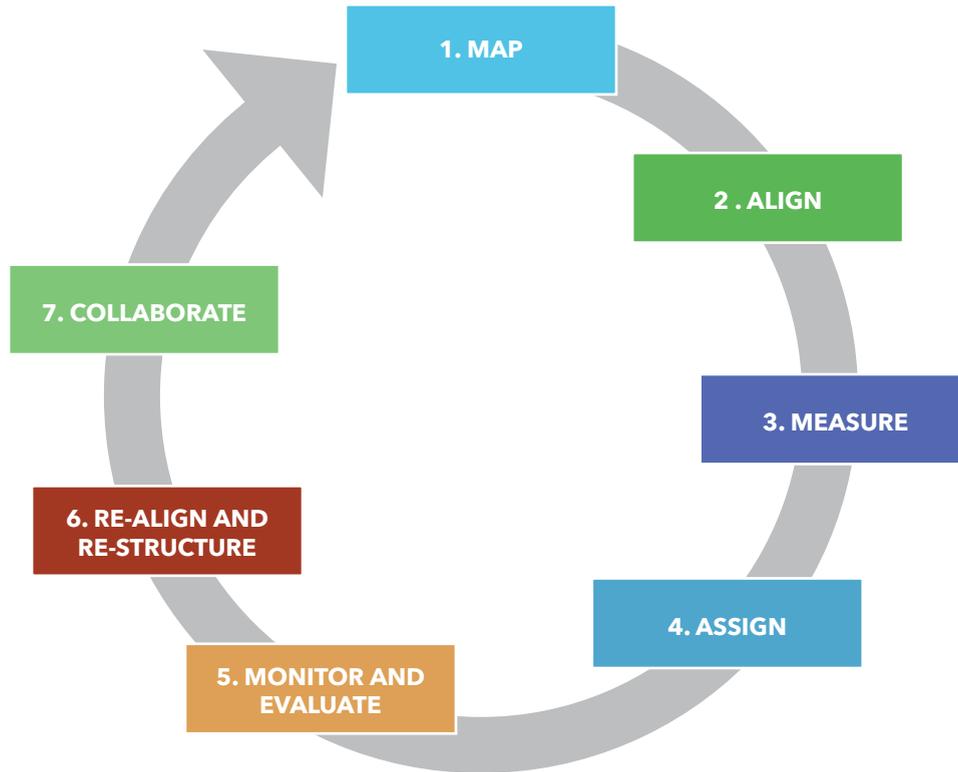
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HIGHLIGHTS OF NUST SDGs ALIGNMENT PLAN

Highlights of the NUST SDGs transformation in the last year, along with the organizational commitment, details on SDGs related initiatives and activities will be covered thoroughly in this report, listed by SDGs.

The complete journey of NUST SDGs Alignment plan is as follows:

JUN 2018	<ul style="list-style-type: none">• SDGs Alignment Initiation• Case Studies	JUL 2019	<ul style="list-style-type: none">• 1st Internal Session with key stakeholders on SDGs• Assigning of respective KPIs to internal stakeholders• Briefing on using SDGs portal
JUL 2018	<ul style="list-style-type: none">• Analysis of SDGs framework for academia sector• KPIs and targets setting for academia and HEI• Mapping of domains and key activities of NUST with SDGs	AUG 2019	<ul style="list-style-type: none">• NUST selected as Cohort for Millennium Fellowship 2019
NOV 2018	<ul style="list-style-type: none">• International Training of trainers on SDGs	SEP 2019	<ul style="list-style-type: none">• Multiple one-one sessions with internal offices for reporting on their respective KPIs
DEC 2018	<ul style="list-style-type: none">• International memberships (UNAI, AASHE, SDSN, SDG ACCORD)• Mapping of Research and Innovation with SDGs	NOV 2019	<ul style="list-style-type: none">• Internal data collection on SDGs Portal• Compilation of first Annual SDGs Report
MAR 2019	<ul style="list-style-type: none">• Establishment of cross sectoral collaborations on SDGs• Identifying key stakeholders within NUST for SDGs alignment plan	DEC 2019	<ul style="list-style-type: none">• 2nd Internal Session with key stakeholders on SDGs• Launch of NUST SDGs website• Submission of data for THE Impact Rankings 2020
JUN 2019	<ul style="list-style-type: none">• Assignment of KPIs to key stakeholders within NUST• Development of SDGs Portal		



1. MAP

As the first step, we performed the analysis of research & innovation portfolio, curricula and all operations within NUST as well as analysis of internal capabilities and resources in implementing SDGs. An extensive mapping was conducted, spanning over more than 7 months of extensive work:

- 1000+ Research projects mapped
- 7000+ Publications Mapped
- 650+ Patents mapped
- Key activities of 20 administrative offices of NUST mapped with SDGs.
- Activities of 18+ Schools/ departments, Programmes, courses mapped with SDGs
- Startup Competitions, Community Clubs Services, Events mapped with SDGs



2. ALIGN

The university core functions were aligned with the respective SDGs targets and eventually 17 goals, by disaggregating the national level targets and KPIs of SDGs framework into relevant achievable milestones and KPIs for appropriate alignment with the academic core functions.



3. MEASURE

“What gets measured is what gets improved”.

Although there are 232 SDGs Framework KPIs, 69 Targets and 17 Goals at national levels, indicators for organizations can be variable according to the type and the sector of the organization. Therefore, for a higher education institute, the KPIs selected were only those pertinent to the deliverables of a university in the context of youth and students’ engagement, research and innovation and green campus initiatives.

Measure only relevant KPIs

The choice of KPIs has to be made very carefully as the right KPIs will set the focus of the university / organization in their strategy and plan for SDGs alignment. Other important reasons why KPIs selection is very crucial because:

- Costs of measuring KPIs is very high
- Not all KPIs are relevant to the organization and its core strategy/ functions
- Wrong choice of KPIs can lead to misleading outcomes and inadequate performance, and eventually affect the results
- Only KPIs relevant to NUST Internal Domains and Stakeholders need to be selected

NUST adopted a set of 242 KPIs, under four different domains which were selected on the basis of relevance to the organization and its long term strategic goals and modes of operations:

Domain/ Sector	SDGs	Targets	Indicators
Research & Innovation	17	34	67
Academics & Youth Engagement	14	26	64
Ops & Governance	14	46	111
NUST TOTAL	17 (SDGs Overlapping)	66 (Targets Overlapping)	242

4. ASSIGN

Once the set of KPIs were selected, these KPIs were assigned to 20+ administrative offices and relevant schools/ colleges of NUST. A dedicated online portal “NUST SDGs Portal” has been developed to track and measure the performance and impact of the organization in terms of SDGs.

Several internal sessions were held with the stakeholders to brief them on SDGs framework, KPIs assignment, reporting methodology and usage of the portal. They were also briefed on setting targets, devising plans and policy amendments to improve on these KPIs.

5. MONITOR AND EVALUATE

To formulate a better SDGs implementation strategy, we need to understand where action is needed. Tools to gather, present and disseminate SDG data are key to ensuring their extensive and effective use by policymakers. Reporting and dissemination platforms for SDGs are indispensable to policymakers and, indeed, to all stakeholders for understanding where progress is being made and informing future interventions. Data must be:

- Accessible
- Publicly available,
- Relevant
- Easily visualized and
- Analyzed - to those who want or need to use it.

The monitoring and evaluation on the progress against the KPIs are being conducted through the SDGs Portal, on which a dedicated dashboard to monitor performances by offices as well as an overall performance by SDGs has been developed, which provides us a bird’s eye view of the organization’s standing in terms of SDGs.



Dashboard by SDGs



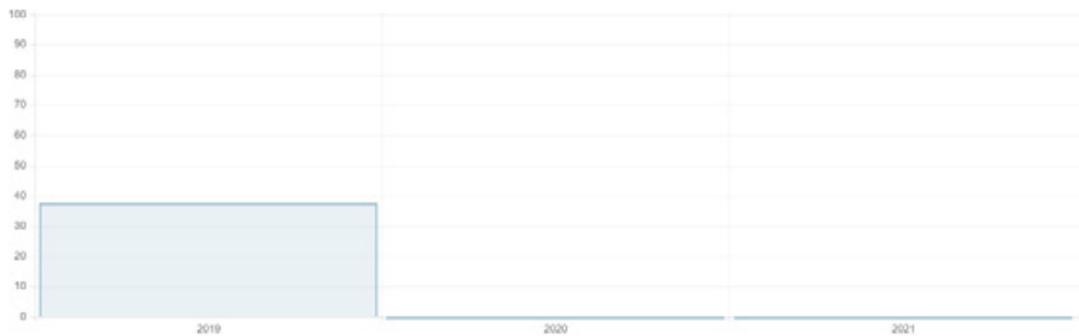
SDG wise Performance based on assigned KPIs

SDG 4: QUALITY EDUCATION SUMMARY

Total No of Offices which are assigned "SDG 4: QUALITY EDUCATION" are 5

Total No Of KPIs of "SDG 4: QUALITY EDUCATION" are 22

Year wise Performance of SDG 4: QUALITY EDUCATION



Office wise Performance of SDG 4: QUALITY EDUCATION

Office Name	SDG Goal No.	Ranking	SDG Target	Action Year	Action Completion Status
Acad Dte	SDG 4: QUALITY EDUCATION	The Impact	4.6		

Acad Dte

Lifelong learning opportunities provided: Does your university as a body provide access to educational resources for those not studying at the university, e.g. computers, library, online courses, access to lectures, etc? (Evidence required, select from the following: Free Access Charged Access)

6. RE-ALIGN AND RE-STRUCTURE

The plan also considers realignment and restructuring once the cycle is over, and the KPIs are re-aligned with new initiatives, new technologies or Programmes started at the university. The process is a continuous improvement cycle and does not halt at the end of a year, but takes continuous efforts to improve and re-align on the KPIs assigned. New policies, strategies and initiatives must be introduced for a complete re-alignment and re-structuring in accord with the SDGs.

7. COLLABORATE

We use “Systems thinking” to implement SDGs, which give us a framework for assessing the whole picture and understanding complex dynamics and interdependencies. Systems thinking are based on a collaborative model instead of working in silos and identifies “Key Leverage Points” within a system. For NUST, it means operating on three levels:

- joining up with others’ efforts to achieve individual goals
- looking at the inter-relationships between all the goals
- and finally delivering the goals in a way that models the characteristics we need for a sustainable society.

NUST not only held various collaborative and interactive sessions to engage internal stakeholders, more than 20 offices and schools of NUST, to work towards a unified goal of SDGs alignment, but also established cross-sectoral partnerships and international memberships for the cause.



1st Session on NUST SDGs Alignment Plan with internal Stakeholders 2019



2.0

NUST Selected as Cohort for Millennium Fellows 2019

NUST was nominated as Cohort for Millennium Fellows for 2019 out of 1,209 campuses across 135 nations by the Millennium Campus Network (MCN), a Boston-based global non-profit convening and training social impact leaders. MCN and the United Nations Academic Impact (UNAI) formulated the Millennium Fellowship - a semester-long leadership development programme



for selected campuses worldwide, convening, challenging, and celebrating student leadership that advances the Sustainable Development Goals (SDGs).

NUST's academic, research and operational alignment with SDGs and its efforts are globally acknowledged as NUST becomes part of several SDG-focused networks and builds international partnerships with institutions working towards the same end. NUST's nomination by MCN was a testimony to its growing engagement with SDGs.

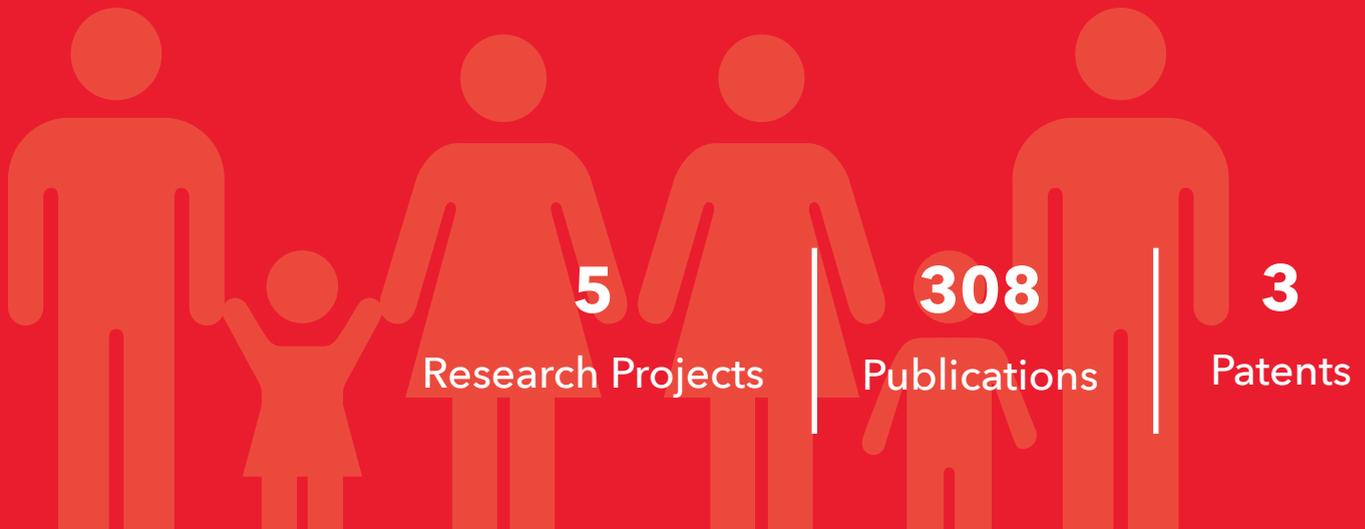
In 2019, 16 students from NUST had been selected as Millennium Fellows, advocating 6 community service projects, including Bhook (Hunger), Darakshan, Filler Up, Recycled Road and Street School, which are covered extensively in this report.

The Millennium Fellows attended remote training sessions arranged by MCN, advocated for the causes/ community service projects committed to localizing the SDGs and building communities. At the end of the Fellowship in December 2019, the Fellows received certificates of recognition from MCN and UNAI. And NUST, being the Cohort for Millennium Fellows, received international recognition for its contribution towards SDGs localization and societal impact.



GOAL 1

No Poverty



NUST outreach to Balochistan and FATA

PKR 50 million allocated to Balochistan Campus under NEED initiative for Students Scholarships

NUST has been extensively working to expand its academic services to under-developed and under-represented tribal regions of Pakistan for the capacity building of the youth of these areas at par with international standards. Therefore, by investing in such capital intensive outreach Programmes, NUST has proven its commitment to the reduction of economic disparities across all regions of Pakistan through quality education.

NUST has started academic classes in Undergraduate Programme in NUST Quetta Campus, where more than 150 students are currently enrolled in UG engineering programme.

First-Generation Students

NUST has around 35% of first generation students, i.e. whose parents were never enrolled for higher education. Such a large proportion of students at the campus speaks of our contribution towards bringing out an increasing number of families from poverty.

NEED Initiative

1800+ Students Studying on NEED based scholarships, 127 Free Seats

NUST aims to be a need-blind university, affording education to all those who make it to the university on merit. In this respect, NUST looks after the financial needs of the students from underprivileged and underrepresented groups from all across the country, through partnerships with NUST alumni, private donors, and government



agencies for funding. More than 1800 students are studying on need-based scholarships in NUST since 2015, and 127 of the targeted 400 seats have been made free for scholars through a permanent endowment.

EHSAAS Scholarships

EHSAAS is a project funding under Government of Pakistan's 'EHSAAS social safety Programme which aims to provide 50,000 undergraduate scholarships with an average budget of PKR 6.0 BN annually. Over a period of next four to five years, these scholarships will be increased to around 200,000.

Higher Education Commission of Pakistan (HEC) is implementing EHSAAS programme in 118 national participating universities. NUST has been actively engaged in the programme with HEC and has been offered 816 scholarship slots in 2019-20 full-year. The scholarship covers university tuition fee and stipend throughout four-five years of degree duration. This is an exceptional example of cross-sectoral collaboration to alleviate poverty at a national scale.



Helped a deserving person through purchase of Rickshaw to support his family at Nowshera



Provision of Lab Facilities at Govt School Rahim Yar Khan



Community Service for poverty reduction

College of Aeronautical Engineering (CAE), a constituent college of NUST in Khyber Pakhtunkhwa Province (KPK), holds various community service activities which include several initiatives aiming to provide basic facilities in the community and reduction of poverty. Such initiatives include:

- Financially supporting families through fund raised by students and faculty
- Up-gradation of facilities in schools in remote areas of KPK province
- Blood donation camps
- Provision of food and books at Edhi homes, an international acknowledged organization supporting orphans and widows, and SOS Village KPK
- Free career counseling lectures
- Provision of free drinking water at remote areas.



Food items and books distribution at SOS Village, Peshawar



Installation of water cooler at Govt Primary School, Risalpur

The Impact of Microfinance on Poverty Alleviation and Women's Empowerment in Rahim Yar Khan

There has been global attention on the poor and life-threatening extreme poverty. A number of international development organizations have put poverty alleviation to the forefront of their core policies. Microfinance (MF) has played a pivotal role in poverty eradication and women empowerment. Existing studies on the impact of MF on women empowerment have focused on specific microfinance institutes, villages, countries or regions, with mixed findings. This research by leading women researchers at NUST aims to examine the impact of MF on alleviating poverty and empowering women in Rahim Yar Khan, a city in Punjab Province of Pakistan. Sample data will be collected from 4 MF institutions across Rahim Yar Khan from 2500 participants over a sample period of 2018-2019. This study will utilize panel regressions, and test for fixed and random effects to determine if MF alleviates poverty by increasing the level of household income and improving the education, health and living standards. The study also intends to examine how MF can empower women by increasing their access to finance and improving their decision making power.

Poverty mapping using satellite imagery and spatial data

Poverty is an economic and social problem in the developing world, with around 10% of global population living below the poverty line of \$1.9 a day.

The suggested project uses satellite imagery to estimate the poverty struck areas in Pakistan and proposes to employ the machine learning and computer vision techniques to develop a cost effective and a scalable system that can map impoverished and developed areas in Pakistan.

Such estimation is effective in filling out existing data gaps on poverty and enable policy-makers to devise policies in accord with the evidence or pieces of evidence .





GOAL 2

Zero Hunger

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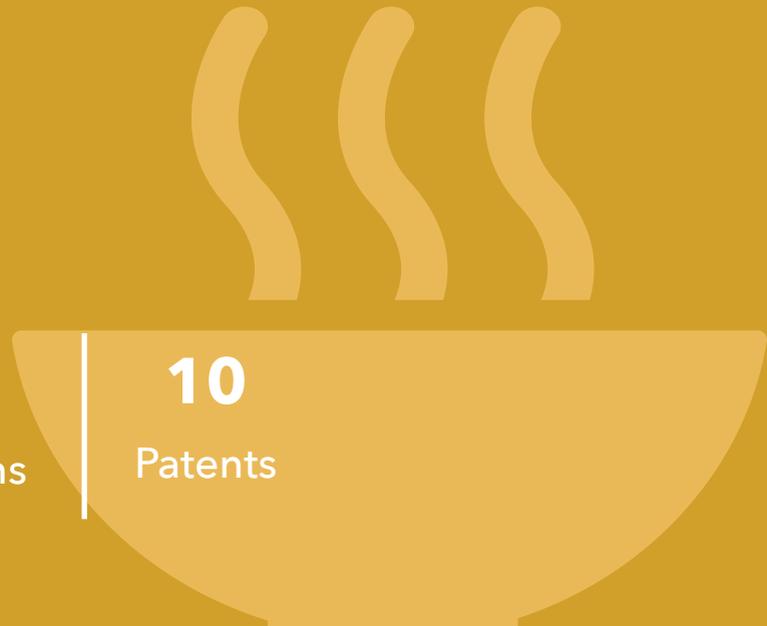
Research Projects

142

Publications

10

Patents



Bhook

BHOOK is a project by one of the Millennium Fellows of NUST 2019, which aims at eradicating hunger in the bottom of the pyramid (BOP) segments of society, not having the disposable income or purchasing power to get food which is a vital aspect of life. The measurable goals of BHOOK include, but are not limited to:

- Sector-based project implementation to evaluate the number of people served to convert the serving size for a number of meals.
- Create and connect with the local business clusters of corporations minimizing the bullwhip effect.
- Enhancing female participation in the formal economy through participation in the BHOOK female employment programme.
- Non-Government Organizational Partnerships in similar industrial domains to create parallel social impact.



Ramazan Drive in collaboration with Daraz.pk

NUST Community Service Club collaborated with Daraz.pk for a Ramazan ration drive. Volunteers collected funds for distribution of Ramazan ration boxes in collaboration with Daraz.pk. 73 boxes were distributed in Noreen Welfare Trust, an orphanage with 90+ children, and a village in South Bara'kahu, Dhok Mohri near Islamabad. The boxes contained 3 months' dry ration items including rice, flour, dates to fulfill dietary requirements of the whole family.



Cattle Vitals: A Smart System for Silent Heat and Early Disease

Cattle Vitals is a product developed by NUST researchers to intelligently detect the heat signs in buffaloes through sensing pH, conductivity, temperature variation and raised physical activity. These parameters are fed to a decision system algorithm that estimates and predicts the best time for AI and informs the farmer through a smartphone application. Sensor based solution is validated through the lab based heat detection techniques which are available at National Agriculture Research Council (NARC) farm in Islamabad. The proposed project increases the conception rate in buffaloes in Pakistan and hence indirectly contributes in increased milk and meat production. The aim of this project is to automate the process of identification of silent heat, especially in buffalos, with a low cost sensor based solution.

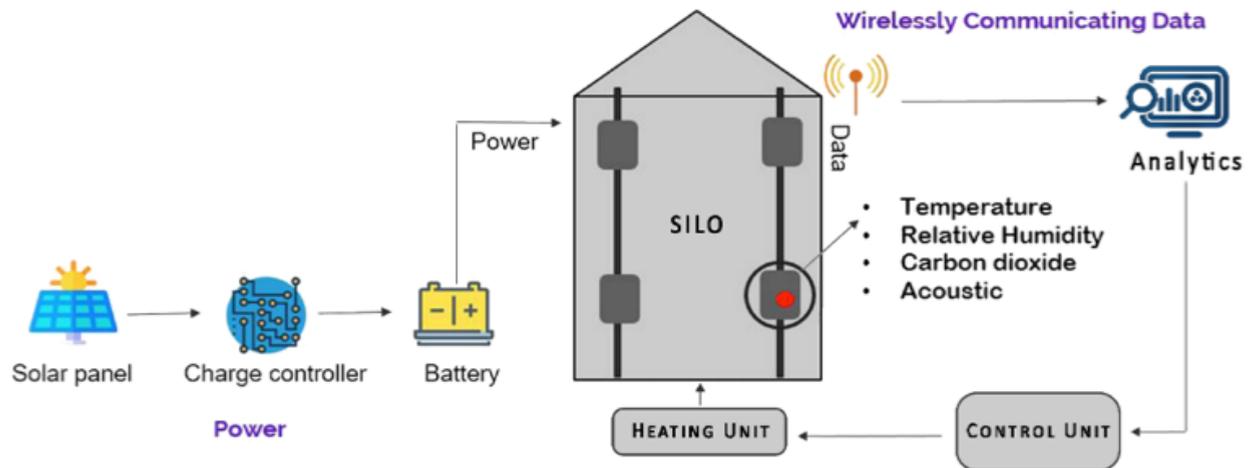
Modeling and assessing the water, energy, and food security in the Indus River basin

This project, by NUST constituent Institute of Environmental Sciences and Engineering (IESE), under the DAAD German Academic Exchange Services, has been conducted to achieve the following objectives:

- a. Human resource development: Training and exchange of international expertise through collaboration and technical training to develop skills in water, food and energy resource management applications with a focus on Indus Basin sub-watersheds.
- b. Provide scientifically sound recommendations for the allocation of water resources using Water Evaluation and Planning System (WEAP). Determine the requirements for a practical management system for allocation of limited water resources between agricultural, municipal and environmental uses as well as evolving situations.
- c. Improve linkages among stakeholders: Tools and mechanisms for collaboration and linkages established among government, non-government and academic institutions to respond to water, food and energy coupled challenges more effectively and efficiently.

Solar Powered Temperature and Relative Humidity Monitoring for the Multipurpose Silo Bin

A lot of food losses in Pakistan occur during the supply chain of the food from farm to market. In order to minimize the losses of the food value chain, our researchers have designed a cost effective and economically viable prototype wireless temperature and relative humidity monitoring digital system to monitor temperature and humidity values within a silo and also manage operations of humidifier to control these parameters within the desired range. The ultimate objective is to reduce the post-harvest losses, which will lead to an increase in food availability.





Drying of freshly harvested grains is essential to ensure its conservation. Therefore, the same technology will also be applicable for the progressive growers, seed companies and traders of wheat, chickpea, maize, sunflower etc. After its evaluation, this system will be made available for commercialization to paddy seed companies, millers, and traders for monitoring the inside environment of their grain storage silo bins.

Urban expansion as an Incursive factor for food Security: An Assessment of Spatio-temporal Variations in Punjab province, Pakistan

Punjab province of Pakistan has two major seasonal crops cycles: Rabi and Kharif. The major challenges in the province are related to rapid urbanization which has affected crop production. This project by researchers at NUST constituent Institute of Environmental Sciences and Engineering (IESE) estimates the urban growth rate during 2000-2017 by the derivation of agriculture land change and its potential effects on agriculture food security of Pakistan.

This research will help to plan and manage sustainable urban development by avoiding the utilization of vast fertile agriculture lands. This study is not only important to identify the variations in croplands but also other potential issues such as a change in cropping pattern, cropping intensity, forests, vegetation, barren lands, water bodies, urban and industrial settlements, to effectively tackle the challenges prevailing due to the urban growth in Pakistan in context of agriculture sector and food security issues.



GOAL 3

Good Health and Wellbeing



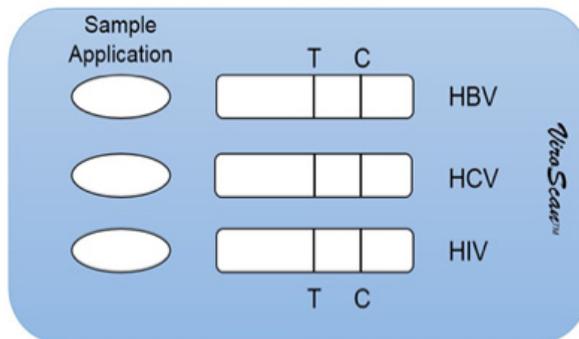
Industry: ViroScan

NUST transferred **3 X IPRs** of the Project for the development of a single diagnostic kit to detect multiple viruses to the local Industry, ViroScan. It detects viruses like **HIV, HCV and HBV** simultaneously.

The simple, non-invasive, low-cost paper strip would help in early diagnosis at home. The lateral flow assay used for the development of this diagnostic kit is based on six specialized parts of paper-based strip: sample pad, conjugate pad, nitrocellulose, test line, control line and adsorbent pad. Of these regions, the conjugate pad, test line and control line are of importance for the specificity of diagnosis.

Once saliva is applied to the sample pad, capillary action leads it to conjugate pad, where it specifically binds and is detected via color change. Such licensing agreements signify NUST's contribution to enhancing the National Innovation Index and Knowledge Economy of Pakistan, and its role in making health facilities accessible and affordable.

ViroScan™
"A test in time,
saves life!"



Medical Devices Development Centre (MDDC):

NUST has taken an initiative and established a Medical Devices Development Centre (MDDC) intending to indigenously mass produce medical devices and implants including Bare Metal Stents (BMS), Drug-Eluting Stents (DES) and Percutaneous Transluminal Coronary Angioplasty Balloon Catheters (PTCA balloon catheters).

MDDC is thus an indigenous production facility for cardiac stents which is mandatory in Pakistan to meet the growing demands; as the incidence rate of coronary heart disease has tremendously increased. We are offering low-cost, high-quality treatment solutions to people.

A highly trained team of scientists has been hired for this purpose; MDDC is also continually running its research wing for the improvement of the existing products and also for the development of new medical devices. This is a trendsetting initiative in a country like Pakistan so that other industrial groups operating in Pakistan will follow the same trail and revolutionize the medical device industry in this country.



Production of Cardiac Stents

NUST has become the first university in Pakistan, to begin with, the production of cardiac stents. NUST has started producing coronary stents which are commonly placed in coronary arteries to supply blood to the heart, to keep the arteries open in the treatment of coronary heart diseases and it'll be the first university that will be doing so to reduce the burden from poor patients. The Medical Devices Development Centre (MDDC) at NUST School of Mechanical and Manufacturing Engineering successfully developed the devices for the first time in Pakistan.



Blood Donation Drive

Blood collected: 1126 pints

Pakistan's annual blood transfusion requirement is approximately 1.5 million bags, with 40% of the demand being met by the public sector. NUST Community Services Club (NCSC), in collaboration with registered blood banks and hospitals, holds 4-day blood donation drives at campus every semester.

NUST Community Service Club (NCSC) initiated the year 2019 with its signature event, the Blood Donation Drive, with helping thalassemia patients being one of its foremost objectives, alongside creating a sense of responsibility and brotherhood among people and helping those in dire need. Two blood donation drives were held in collaboration with Jamila Sultana Foundation, AFIT and Sundas Foundation.

With the help of NUST Administration, hardworking organizers and generous donors, NUST Community Service Club conducted its longest and highest donations collected through the Blood Donation Drive by collecting 1126 blood pints.



Eye camp 2019



NUST Community Service Club (NCSC) continued with its tradition by organizing yet another successful free Eye Camp in 2019. This camp served to instill a spirit of community service by promoting a better vision and treating people's eye problems completely free of cost. This comprised not only free checkups, but also medicines, spectacles, and further prescriptions; all of this aimed to support better eye health in the community.

The registration desk was set up outside the Medical Centre of NUST and the team of eye specialists and paramedics from Al-Shifa Eye Trust were welcomed and given their respective stations. People started filing in early on. Enthusiastic volunteers of NUST Community Service Club were continuously present to guide people with the procedure.

It was pleasing to see people of all age groups, staff and students showing up for their eye exam. Even more satisfying was that the majority of these people comprised of the bottom decile income group along with their families, who could not afford eye check-up. More than 717 registrations were made in the two days of eye-camp.

"Lost in Bloom"- a breast cancer awareness play

Under the NCSC's project "Fempower", an event aimed to bring breast cancer awareness among the students of NUST was organized in collaboration with the Higher Education Commission of Pakistan and Pink Ribbon campaign. The event was conducted in one of the cafeterias of NUST in which pamphlets were distributed among students that emphasized upon the importance of self-examination, screenings and spreading the word widely in the society.

The play depicted the emotional and social turmoil a woman passes through when she is diagnosed with breast cancer. Hand gestures and facial expressions were utilized efficiently to show her battle against cancer, the hurdles she faces in getting back towards a stable life and society's attitude towards this. At the end of the performance, students stood behind the performers to show their solidarity towards women suffering from breast cancer and their resolve on eradicating the misconceptions, taboos and myths associated with it.



Kidney Health Awareness Camp



Kidney Health Awareness Camp was held for a full day, organized by NUST Community Service Club in collaboration with Pakistan Kidney Patients Association (PKPA), a non-profit organization that aims to reduce kidney diseases by spreading awareness in the general public and providing free consultation and treatment.

A lecture was given by health care professional from PKPA, explaining kidney function and the factors leading to kidney failures, such as diabetes and high blood pressure. He then proceeded to brief the students about the kidney tests available that help in the early detection of kidney disease. Moreover, he stressed the importance of maintaining a healthy lifestyle in order to prevent any kind of kidney failure. The session provided the students' opportunity to ask any questions they might have regarding kidney health. Informative brochures providing further details regarding kidney health were then handed out to the students at the end of the session.

Mental Health and Counselling

Depression and mental health issues are constantly at a rise, especially among youth, becoming one of the major areas of concern alongside physical well-being. To address such issues, NUST is working to help individuals with such problems by offering extensive psychological help. The Centre for Counselling and Career Advisory (C3A) at NUST is committed to addressing NUST students' psychological and emotional concerns and helping them achieve their intellectual, academic, and personal goals. C3A provides short-term individualized therapy, group therapy, crisis support, and psychiatric services.

The centre organizes week-long camps every semester to promote awareness about mental health and encourages students to seek therapy.





GOAL 4

Quality Education

9

Research Projects

372

Publications

13

Patents

3

IPRs Licensed to
Industry

Industry: AWAAZ AI Tech

NUST licensed out 3 X IPRs of project for Autistic Children to the local Industry, AWAAZ AI Tech. Our researchers have successfully developed AI-based application which will provide interactive learning modules for Autistic Children ultimately addressing a huge challenge which autistic children are facing in terms of learning and education not only in Pakistan but also globally. The application relies on AI algorithms for customization to different learning and communication needs of autistic children at different stages. Aawaz generates different sentences from random selection of words and encourages user to learn and create new sentences. Aawaz improves vocabulary, language learning and social interactions for the children which need special attention, without compromising on the speed of communication.



NUST Academic Programmes

17,483 Current Students, 132 Academic Programmes, 19 Constituent Schools & Colleges, 7 Campuses in 5 Cities, 400th Globally QS World University Rankings 2020

NUST offers top-notch education with a comprehensive curriculum of 29 UG, 61 Masters and 42 Ph.D. programmes, offered in 19 different schools and colleges, all over Pakistan. NUST has an enrollment of 17.5k students and boasts of a competitive pool of 1186 faculty members out of which 50% are Ph.D. qualified. NUST is the top university of Engineering and Technology in Pakistan, and 400th in the world according to QS World University Rankings 2020. NUST has also been nominated in the list of the top young universities of the world, declared 51st among world universities under the age of 50 - QS World University Rankings 2020.

Labs and Research Facilities

NUST has been equipped with state-of-the-art labs to facilitate practical knowledge and applied research. There are more than 330+ labs for UG programmes and 35 key labs for advanced research. NUST also provides on-campus cloud infrastructure offering IAAS, SAAS services. Some of the notable research-intensive labs include Anechoic Chamber, Image Processing Centre GPU-based Supercomputing, Supersonic Wind Tunnel, Material Characterization Facility at Micro & Nano level, Smart Grids, Robotics & Control Lab and Neuro-Informatics, etc.

Professional Development Centre

600+ Pieces of training, 13000 Personnel Trained, 800+ organizations

PDC is imparting high quality continuing education to NUST employees and industry professionals in the field of Management, Engineering and Information Technology. PDC has conducted so far 600+ training and trained more than 13000 personnel and made a huge clientele of over 800 organizations. PDC is leveraging upon a rich faculty base of 1200 members of NUST, including more than 600+ PhDs.

PDC is considered one of the most sought after institutions of Pakistan for short term courses in various fields and has maintained a tradition of excellence since its inception in 2007. The prime objective of PDC is to provide access to knowledge, capacity building and continuing education facility to professionals from all walks of life.

Al-Qalam Programme MacJannet Award Winner by Talloires Network 100 Children fully-funded

NUST Community Services Club (NCSC) Al-Qalam Programme was launched in 2015 by two highly motivated members of the club. According to the National Education Management Information System (NEMIS) statistics on education in Pakistan, more than 40% of children between the ages of 5 and 16 are not enrolled in schools. Moreover, more than 60% of children in schools drop out before matriculation at a college or finishing university. Most of these children are deprived of education because of their families' financial constraints. NCSC members decided to play their role in ameliorating this situation and help, thus, Al-Qalam (Arabic: مِلقَلَم، "The Pen") was born.

The programme was launched on the basis of voluntary monthly donations of Rs. 100 from NUST students and faculty members.



Al-Qalam Programme is an on-going project, run by council members in coordination with class representatives nominated by elected class ambassadors from all departments of NUST. This system assists in enabling coordination and ensures a hassle-free process for collecting donations. In 2018-19, 100 underprivileged children were being funded by this programme. The programme recently won the third place for the prestigious MacJannet programme by Talloires Network. The cash prize worth USD 2500 will enable this programme to further contribute to the cause of providing equal education opportunities to all members of society.

Central Library and Affiliated Libraries

**350,000 books/e-books and
30,000 journals/e-journals**

A state of the art Central Library has been established in H12 Islamabad Campus along with 17 institutional libraries in different NUST campuses all over Pakistan to house more than 350,000 books/e-books and 30,000 journals/e-journals. Such a facility is open to NUST students, faculty and staff to promote reading culture, facilitate group studies and conduct training on citation management, information literacy and search management. NUST has continued to revive book-keeping culture as well as upgraded the facility with digital formats like e-books/e-journals to keep up with the pace of the modern age. The students are facilitated with publications, presentations, and writings in all formats free of cost, thus committing to free access to education for everyone.

Street School (Sarrak ka Sitara)

'Street School' is one of the projects of Millennium Fellows '19 which aims to create and implement an education/schooling model for young children in the underprivileged slum areas. Street School specifically targets a slum area just beside the NUST campus where displaced Afghan migrants are settled. The goals for the duration of the Street School project of Millennium Fellowship include:

- Designing a curriculum which will cater to different age groups. The curriculum has been customized according to the children's previous exposure to schooling/education. It focuses on basic literacy including but not limited to mathematics, ethics, and morals, interpersonal and soft skills.
- It aims to educate at least 5 students every year to the degree that they are able to join a grade of their respective age group in a functional school. To sponsor their education, funds are also raised by different means.
- To create a solid foundation/organization for the project to sustain it through volunteers' efforts; and expand its radius to other nearby slum areas.



SUMMER SCHOOL

The Summer School at one of the constituent NUST Colleges, College of Electrical and Mechanical Engineering, organized by the National Centre of Robotics and Automation (NUST), was held for two weeks in mid-summer of 2019. This was an exceptional opportunity for the students from different local schools who spent their summer vacations learning the basic programming and interesting electronic circuits concepts to build robots and thus, explored a completely new world of technology. The excitement and enthusiasm of the students were truly admirable.

30 students attended the Summer School and they also participated in various physical activities and games like horse riding and archery, proving to be a great learning experience for the students.



STUDENTS CLUBS AND SOCIETIES

Dedicated office for activities (Students Affairs Directorate, 30+ Students Societies, and Clubs, 5000+ Annual Students Engagement)

Besides academic excellence, NUST ensures that students also develop literacy, creative and leadership qualities to tackle the global challenges. Therefore, NUST has the establishment of several societies and clubs for students to provide them with opportunities to pursue their passions, participate and arrange events under the auspices of a dedicated directorate. The office, Students Affairs Directorate, is responsible for arranging and coordinating co-curricular activities at the campus. The following central clubs and societies are currently operational in NUST:

- NUST Bazm-e-Pakistan (NBP)
- NUST Adventure Club (NAC)
- NUST Environment Club (NEC)
- NUST Science Society (NSS)
- NUST Literary Circle (NLC)
- NUST Book Club (NBC)
- NUST Community Service Club (NCSC)
- NUST Dramatic Club (NDC)
- NUST Debating Society (NDS)
- NUST Media Club (NMC)
- NUST Fine Arts Club (NFAC)
- NUST Bio Reach Society
- NUST Entrepreneurs Club (NEC)
- NUST Leaders Society (NLS)
- NUST Excursion Club (NEC)
- NUST Digital Club (NDC)
- NUST Water Sports Club
- NUST Technical Amusement Club (NTAC)
- NUST Paragliding Club
- NUST Robotics Club (NRC)
- NUST Quiz Club (NQC)
- International Chapter (SCME)
- NUST Trekking Club (NKC)
- NUST GeneUs
- NUST Archery Club (NAC)
- NUST Cultural Club (NCC)
- NUST Fitness Club (NFS)
- NUST Physics and Astronomy (NPA)
- Institution-based Clubs and Societies



Artificial Intelligence Boot Camp

**43 team's participation,
200+ outreach, 1+ industry
Engagement**

NUST held a week-long intensive Bootcamp in Artificial Intelligence and Machine Learning. The objective of this activity was to introduce participants from academia and industry to the basic and advanced concepts of AI and Machine Learning in a crash course format. Speaker from local industry Sky Electric Pvt. Ltd delivered a lecture on the applications of AI and ML in the Smart Grid domain.

The format of the Bootcamp was designed to introduce both the theoretical and practical aspects of AI, and enhance the learning of the participants in the field of AI.

A total of 43 participants registered for the Bootcamp. A project competition was held on the final day of the Bootcamp and the best projects were honored based on evaluations of a panel of judges. Projects "Verification of Air Written Signature" and "Yolo Based Object Detection" were declared winners and runners up for "Best Technical Award" respectively, whereas, "Best Upcoming Talent Award" was given to recognize teams consisting of newcomers who had little to no experience of working in AI and ML, before the Bootcamp.

The primary criterion for this award was a demonstration of the maximum amount of learning within the span of the Bootcamp. The project titled "Exoplanet Detection Using Light Intensity" was declared the overall winner.

Application of BIM and VR for Effective Education in Construction Industry in Pakistan

The construction industry of Pakistan has slowly but positively been moving towards digital solutions since the advent of Information and Communication Technologies (ICT). By moving in the same path, the education practices in the construction domain also warrant the adoption of more digital content for efficient knowledge transfer.

The project being conducted at NUST proposes the application of Building Information Modeling (BIM) and Virtual Reality (VR) to formulate effective construction education practices in Pakistan. The study will develop an application model/framework for the incorporation of BIM and VR in construction education practices. The research infrastructure desired to be procured through this application will contribute to the future innovative research projects involving the areas of Building Information Modeling and Virtual Reality.



Project “Implementation of School-based universal preventive Intervention: Prevention of disruptive Behavior in Children”

Training and research in class management are getting global attention these days, as such strategies play a crucial role in effective education and child development. Access to alternative strategies of discipline has proven to be a promising step for reducing the students’ disruptive behaviors in the classroom and curbing the teachers’ punitive discipline strategies along with preventing later behavioral difficulties. However, few preventive and evidence-based classroom behavior management strategies are employed in schools worldwide, including Pakistan. One intervention for classroom management, Good Behavior Game (GBG) is recognized as an evidence-based and promising preventive strategy to reduce children’s early classroom disruptive behavior. Therefore, the proposed study investigated the teachers’ reported frequency and types of disruptive behaviors in primary grades of schools in Islamabad with the help of an interview guideline. Implementation of the project would supplement the mental health service by preventing behavioral problems and would have a positive impact on the primary education sector.





GOAL 5

Gender Equality

6

Research Projects

71

Publications

5

Patents

Female Representation in NUST

Science and technology is a field where women are usually under-represented globally with an evident gender gap. Despite being a university focused on engineering and related technologies, NUST has managed to provide an environment conducive for women to pursue an education in these fields, with current female enrolment at 30%. The university also facilitates female students by providing them with on-campus accommodation, equipped with appropriate sports and health facilities, with priority given to students from remote areas of Pakistan.

Apart from a healthy female students' representation, NUST also has a female membership of around 22 % in its pool of faculty and researchers.

NUST has a stringent policy on harassment against women at the workplace to provide a healthy environment for women at the workplace.

Project Darakhshan

Project Darakhshan, one of the projects of Millennium fellows, aims at building the capacity of underprivileged women residing in a slum area of Afghan migrants in Islamabad, in terms of vocational skills as well as health and hygiene. Project Darakhshan also serves as a platform for highlighting the struggles of these women in slum areas and advocating gender equity in the Pakistani community. The aims of the project are:

- To empower marginalized women in our community.
- To work for Inclusion of the transgender community.
- Promoting Peace, Tolerance and harmony in our community.

The project executed social media advocacy campaigns on women and transgender rights and established collaboration with NUST Model United Nations for organizing "Health and Hygiene Drive" for women at Afghan slum areas.

Darakshan Project provided a springboard for contributing in Youth policymaking at the provincial level and later as National Youth Policy Advocate through a competitive process at UNDP Pakistan. It also engaged with social sector organizations "Shoor Foundation" and "Peace without Borders" for promoting peace and inclusion in the Pakistani society through Darakhshan platform.



NUST Daycare Facility

To ensure female inclusion in the workforce and higher education, NUST has taken significant measures to facilitate working mothers or women pursuing higher education. A dedicated day-care facility for NUST female students and employees, along with an on-campus school for kids has been established at NUST so that the mothers can carry out their duties without stress. Currently, more than 30 Children are enrolled in daycare whereas 200+ students are enrolled in NUST affiliated school. Such adequate childcare access at arms' length has significantly reduced the burden on mothers.



Fempower @ NUST

NUST Community Service Club (NCSC) initiated Fempower project which aims to provide financial independence to women from underprivileged backgrounds. The project was selected for funding under the HEC Social Integration Programme. In 2019, 2 women from nearby slum areas were enrolled in six months training at the Islamabad Vocational & Technical Training Centre. These women were trained for skills development like clothes stitching and beautician courses. Once the training completed, the women were able to set-up home-businesses and pledged to give back 10% of their income to the project. In this way, the project is expected to become sustainable for other women enrolling in the programme. The NCSC Fempower team visited the centre and took feedback from the head of the institution, which proved to be exceptional.

Baat cheet- Fempower event

“Baat-Cheet” is a Fempower initiative by NUST Community Service Club which aims to provide a platform with a candid environment for women to open up and discuss grave issues like abuse, female rights, problems women face in domestic life and their careers. Some female students take the opportunity and express their poetic and artistic sides by sharing heart-wrenching poems and melodious songs.

Stories, lessons and laughs are shared over complimentary cups of tea and delicious snacks. And as the sun sets, the embellished trees spark up with the laughter, shared experiences and exchanged stories, and forges a bond of sisterhood among all the attendees that they will always cherish for days to come.



Women Empowerment Seminar on International Women's Day



Women Empowerment panel discussion was hosted by NUST Community Services Club on International Women's Day on the topic of Women Empowerment.

The panel members included female faculty members and representatives from students. The debate among the panel members skimmed many topics such as the true meaning of empowerment, the need of a support system in the process of empowerment, while also questioning the need of empowerment in this era. At last, ample time was given for an interactive session of questions and answers. The queries were entertained with objectivity, and some of the audience went forward in sharing their views and stories of struggle. The event ended on a positive note, sending out a message of acceptance, tolerance and constructive change.

At the end of the seminar, goodie bags, including badges to promote solidarity for Women Empowerment were distributed among the audience.

Women Entrepreneurs in Pakistan – Antecedents and Outcomes of Digital Entrepreneurship

A project focusing on understanding the role and significance of digital technology in entrepreneurial ventures has been conducted by NUST faculty, Dr Asfia Obaid.

The purpose of this research was to develop an understanding of female entrepreneurial activities in Pakistan. Although studies increasingly agree that female entrepreneurship does matter for economic and social development, a recent study by GEM Monitor concluded that many countries are not realizing their full entrepreneurial potential owing to the lack of participation by females in new business activities. Overall, the purpose of this research was to investigate characteristics, drivers and strategies women digital entrepreneurs in Pakistan and its influence on economic development in terms of the development of entrepreneurial society.





GOAL 6

Clean Water and Sanitation

18

Research Projects

798

Publications

13

Patents

Waste Water Treatment Plant

With water shortages plaguing the world, water scarcity has become one of the largest threats facing society today, making it one of the UN's main sustainable development goals. Therefore, NUST is aiming to focus on developing new projects and technologies to reduce its water consumption. Our researchers developed and installed the Wastewater Treatment plant which is a low-cost technology requiring minimal energy and operational attention for the treatment of wastewater. A joint project of UNESCO and NUST, it is able to produce 75,000 gallons of recycled water per day for the entire horticulture of NUST. Unlike the rest, wastewater treatment presents a sustainable short-term and long-term solution to water scarcity. Currently, around 20,000 liters of water is being recycled per day which is used for horticulture, thus significantly reducing water usage of the campus.



Water conservation from Waste heat recovery power plant cooling towers

Industry engaged: Fauji Cement Company Limited, Attock, Pakistan

Freshwater is expected to become increasingly scarce, generally at global level and specifically in Pakistan as temperature and sea levels rise due to the global climate change. Water security is an important and growing challenge in Pakistan which extends far beyond the traditional water sector management. It affects not only economic and social development but national and regional security also. To explore the potential of conserving water and using it efficiently everywhere in need of today. In Pakistani context, the legal and statutory pressures are also increasing to limit the underground water usage for commercial purposes.

To reduce the water usage and solve the problem of water shortage to some extent, the Fauji Cement Company Limited (FCCL); a well-established cement manufacturing industry, sought to make the cooling towers more efficient. Waste Heat Recovery Cooling Towers consume a huge quantity of water for compensating evaporation losses and to reduce them was a huge challenge. This project, conducted at NUST for FCCL, identified the causes of evaporation losses of cooling towers at FCCL and devised methods to reduce these losses. The project was successfully completed and deployed in the industry, resulting in several gallons of water-saving for the industry.

Water Conservation Awareness Walk

Against the backdrop of a worsening water crisis in Pakistan and prompted by the potential threat of turning into a water-scarce country, NUST has embarked on a robust countrywide campaign to raise awareness on water conservation among the general masses. As the saying goes, “charity begins at home,” NUST kicked off the massive campaign, starting with an intra-NUST drive, wherein students, faculty and staff were educated about the imminent threats of water scarcity and the urgency both for individual and collective efforts to convert this disastrous situation into an opportunity.

NUST has already advanced to the second tier of its campaign, which aims to awake common people to the looming water crisis. In this context, NUST organized a “Water Conservation Walk”. An overwhelming number of students, faculty and people from different walks of life participated in the water-friendly walk. They were holding placards and banners inscribed with slogans like “water conservation is our national duty” etc. Water Awareness Stalls were installed at various frequently visited spots in Islamabad.



NCSC kicks off water conservation awareness campaign

Campaign: Full Month, Outreach: **46000** school students

With the advent of the Water Conservation Awareness campaign in NUST, NUST Community Service Club has been at the forefront of helping educate the community about this very important cause.

In this pursuit, a team of 9 students, led by a faculty sponsor, visited several schools in Islamabad. Their goal in doing so was: **“Spreading the cause by making people aware of Pakistan’s water situation and stressing on the consequences of negligence in this regard”**

The boys’ team visited two schools for a full month, the outreach of which reached 46000 students of 7th to the 10th grades. Fliers printed with simple instructions and illustrations, on how to save water, issued by the National Engineering Council, were distributed in the classes which the volunteers attended. It was an interactive session where they were asked about the importance of water in their daily lives and what would happen if Pakistan was to run out. Students were told about the crisis, asked to brainstorm about how they could play their role as an individual to save water.

After the survey, 158 more students were being engaged in “Water Conservation Awareness Campaign” as part of their 20 hours’ field assignment 2 of “Community Service Serving Learning Course” in Government and private schools of Islamabad and Rawalpindi.



International Water Technology Workshop

NUST in collaboration with UNESCO organised a 2-day “International Water Technology Workshop (IWTW): Water-related Disaster Risk Reduction (DRR)” in February 2019. Organised at the university’s main campus, IWTW attracted international experts as key speakers from UNESCO, Japan, Australia and China, besides leading national experts in the field, researchers, scientists, water professionals, end-users, managers, decision makers, and stakeholders from universities, research institutes, etc. It offered an opportunity to present and discuss the most recent technological innovations and scientific developments associated with the water-related



DRR. Objectives of the workshop were facilitation of scientific discussion, knowledge exchange and collaboration among experts and stakeholders; discussion on latest scientific research, methodologies, tools, technologies, and policy approaches on water-related DRR and collection of practical cases of this stocktaking on water technologies as a demonstration of the implementation of these tools and approaches for early flood warning and flood management.

The focus of the workshop was also aligned to following UN Sustainable Development Goals (SDGs) framework KPIs:

- By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, holistic disaster risk management at all levels.
- By 2030, significantly reduce the number of deaths and number of people affected and substantially decrease the direct economic losses relative to global GDP caused by disasters, including water-related disasters, with a focus on protecting the poor and the vulnerable.

Roundtable: Managing the Waters; Appraisal of Pakistan’s Problems and Way Forward

A roundtable event, focusing on the water issues of Pakistan, titled “Managing the Waters; Appraisal of Pakistan’s Problems and Way Forward” was held in Oct 2019. Engineer Suleman Najeeb Khan and Dr Muhammad Ashraf, Chairman Pakistan Council of Research in Water Resources (PCRWR) spoke on the



topic and gave their valuable input. The roundtable dealt in detail with the problems and challenges associated with national water resources development, management, and governance. Water experts, professionals, policy researchers, academics, and students attended the roundtable. Renowned experts from Balochistan, Punjab, and Sind were also present.

The roundtable consisted of two major issue-based presentations followed by an interactive discussion in which the participants shared their views on various aspects of the topic under deliberation.



Design and Supervision of Low-cost decentralized wastewater treatment system (DWTS) for Peri-urban Area of Islamabad

The SDG targets for water, sanitation, and hygiene pose a serious challenge over the coming 15 years. In the sanitation sector, moving from basic sanitation (latrine use only) to improved and safely managed sanitation requires either safe excreta disposal on-site or treated off-site.

Pakistan being a populous country is facing alarming urbanization and such scenario requires affordable, effective, and sustainable sanitation technologies either for on-site treatment (without sewers) or piped sewer network combined with off-site treatment for urban centres as well as rural areas.

Under the proposed project by NUST faculty Dr Sher Jamal Khan, sanitation technologies for small to medium sized cities will be investigated for effective wastewater treatment and safe disposal in urban

areas particularly focusing on poor communities in informal settlements. NUST and Water Aid have worked on providing end-pipe technological solutions in the rural area of Muzaffargarh as well as in a controlled environment of Lalamusa Academy. Further, focus would be to maintain oversight and create complete successful models for showcasing nationally. The project also ensures the capacity building of municipality technical staff and local government representatives on applied engineering knowledge and skills to ensure long term sustainability of such solutions. Lastly, the government stakeholders will be influenced with affordable and sustainable wastewater treatment systems (WWTS).



GOAL 7

Affordable and Clean Energy



27

Research Projects

50

Publications

50

Patents

Centre of Excellence in Energy

NUST collaborated with Arizona and Oregon State Universities to establish U.S.Pakistan Centre for Advanced Studies in Energy (USPCAS-E) to address some of the outstanding challenges faced by the energy sector in Pakistan. Strategic goals behind USPCAS-E are to evolve into a Centre of Excellence in applied research catering to the energy sector and economy of Pakistan with the aim to establish efficient governance structures, sustainability, value-added curriculum, and capacity building, promote applied research to serve public/private sector and NUST-US students/faculty exchange programmes. The core mission of USPCAS-E is to efficiently address and implement the E3 criteria (Energy, Environment, and Economy) for sustainable societal development.



Solar Panels Installed in NUST

NUST is focusing on diversifying its energy sources and aims to make all of its campuses carbon neutral in the following years. So far, solar collectors of 500 KW have been installed at two schools of NUST, which are connected to the grid. Furthermore, a solar-powered desalination plant and street lights are also functional in various campuses across NUST.

Retrofitting of Brick Kilns to Improve Energy Efficiency and Environmental Impact

This project aims at indigenously building a retrofitted Zig-Zag design based brick kiln in Pakistan to serve as a model for brick kiln owners in Pakistan. The project had been initiated at the request of Brick Kiln Owners Association (BKO) Pakistan. BKO delegation including Association President and other members visited USPCAS-E NUST and requested to provide technical support and guidance in implementing Zig-Zag based retrofitting of brick kilns in Pakistan. Earlier, National Energy Efficiency and Conservation Authority (NEECA) and Pakistan Environmental Protection Agency (Pak EPA) in collaboration with International Centre for Integrated Mountain Development (ICIMOD) Nepal had recently arranged

a series of workshops to educate Pakistani brick kiln owners about benefits of Zig-Zag brick kilns. As a result, one of the brick kiln owners in Lahore established first Zig-Zag design based retrofitted brick kiln. This brick kiln is performing significantly better than conventional brick kilns therefore, this cost effective retrofitting is expected to replace the conventional brick kiln design for energy efficiency. NUST USPCASE served as a platform for the training of the brick kiln industry stakeholders.

IoT Based Industrial Load Monitoring and Management System

The proposed project focuses on indigenization of an industrial energy monitoring system for large, medium and small scale industries/organizations, housing societies, large civic authorities and smaller organization like universities, hospitals etc. The prototype developed will be an innovative and automated scalable IoT based Industrial Load Management system to monitor the energy consumption in real time.

The system will be deployed at smart energy meters at generation, loads, and distribution and transmission nodes. These meters will collect power profile data 24/7, form a robust communication network using Microchip Wireless (MiWi)/Long Range (LoRa) network and finally terminate at Gateway. The data will be sent to cloud server over GPRS/Wi-Fi/LAN (whichever interface is available) to store, process, analyze and for decision-making. Owing to the fast development in deep and machine learning techniques, data analytics

algorithms will be developed and applied on acquired data, to extract energy consumption pattern, energy predictive analysis, anomaly detection, power quality calculation, accurate metering and calculation of loads efficiencies. Such load management systems are effective in identifying load patterns to optimize energy usage and eventually save a lot of energy by cutting off leakages.

Development of nanocomposites for high temperature thermochemical energy storage

Effective energy storage is one of the challenges our researchers are continuously trying to resolve through research. Our researchers have investigated and discovered composite materials as a promising medium for thermal energy storage. Thermochemical energy storage, based on reversible solid-gas reaction, offer efficiency, seasonal storage, high storage density and cost-effective methods for solar power plants. Concentrated solar power plants (CSP) are potential source of power generation for future technology. The intermittence of power during night time makes this technology less viable. In order to improve the efficiency of CSP plant, it is necessary to incorporate a storage system that can provide the required energy overnight. Calcium hydroxide is a promising candidate as



storage medium due to its high storage density and cheap cost. However, calcium hydroxide suffers from low thermal conductivity, poor flows and subdued cyclic stability. In order to combat these problems, our researchers have added several materials composites to improve the energy storage capacity.

National Conference on Energy Trends

The U.S.Pakistan Centre for Advanced Studies in Energy (USPCAS-E) at NUST hosted “National Conference on Energy Trends” in Oct 2018, to bring together national energy professionals associated with renowned policy think tanks, academia and government sectors, and industrial organizations to exchange information and ideas on energy generation, transmission and storage related developments. The conference was attended by experts from academia, industry and corporate sector.





GOAL 8

Decent work and Economic Growth

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223

Research Projects

17

Publications

17

Patents

NUST Placement Ecosystem

NUST has a strong ecosystem supporting placements of its students for internship and jobs for its graduates, through active engagement with the industry. A large number of on-campus recruitment drives, industry sessions, and alumni talk series are conducted across all schools and campuses. Being a comprehensive university, industries matching each discipline are selected. NUST has thus achieved a 94% employment rate as per QS ranking criteria and ranked as Pakistan's No 1 university in Employers' Reputation.

Preparing Students for Employability

In order to prepare our students for the job market, we implement custom made career development programmes focusing mainly on developing employability skills applicable to the competitive job market. The career development programme includes Career Orientation Seminars, Workshops on Resume Writing, and Workshops on Interviewing Techniques, One-o-One counseling sessions, and Focused Group Discussions (FGD).

NUST-TAI Summer Internship Programme

NUST hosted a delegation from Turkish Aerospace Industries (TAI). During their visit, TAI offered international internships to NUST students, as a result of which, 15 students from different NUST colleges were selected, amongst which College of Aeronautical Engineering (CAE) had the honour to send the majority of its students from both Aerospace and Avionics Engineering departments. The internship was from 3 weeks in summer 2019 and was supervised by a faculty of NUST. The students had the opportunity to experience an internship programme in an International Aerospace Industry. Students also had an opportunity to witness an air show where TAI displayed their aerospace products. Students also visited Middle East Technical University (METU), in Ankara during the course of their internship period.



Technology Incubation Centre (TechOne)

1000+ jobs created, 69 Start-ups graduated, 25 Client Startups, 70% Survival Rate



TechOne is the first Technology Incubator of Pakistan established in academia in 2005 by Pakistan's premier university NUST as a mean to replicate the concept of incubators in Pakistan. It provides a conducive environment for young businesses with all the necessary facilities, training and venture capital opportunities under one roof.

GAP Programme:

Global Acceleration Programme was one of its kind programme which showcased Pakistani startups in Silicon Valley. 12 Pakistani startups were coached by international mentors and entrepreneurs of Silicon Valley. They attended several events, networking sessions such as OPEN forum and Dream Force, held meetings with potential business clients and pitched their ideas to potential investors

This programme success stories are summarized as follows:

- Total funding of the programme USD 460,000.
- One startup idea was acquired by a global telco
- Additional six startups raised seed funding from Silicon Valley VCs/ investors
- Two startups signed partnerships with Silicon Valley Companies

SSBC:

Student Startup Business Centre (SSBC) is hosted at TechOne with an agreement with the Higher Education Commission (HEC) of Pakistan and the Promotion of Education in Pakistan (PEP) Foundation for the establishment of a startup business centre to support startups by students.

The goal of the initiative is to promote talented student entrepreneurs and enhance their practical learning experience at the university. SSBC provides:

- Free co-working space,
- Seed funding,
- Incubation facilities,
- Mentoring and coaching, and
- Opportunities to participate in national and international events to selected student startups



Roundtable: Socio-Economic Implications of the IMF Programme for Pakistan

Against the backdrop of a feeble financial performance of global emerging markets, Pakistan's economic challenges call for dynamic structural reforms, feasible macroeconomic policies and functional trade linkages. Finding practical solutions to these challenges is an urgent national enquiry that demands visionary and comprehensive answers. In this regard, the second roundtable was held on the topic "Socio-Economic Implications of the IMF Programme for Pakistan" in July 2019. Dr Ashfaque Hasan Khan, Principal S3H was the keynote speaker and key economists and finance experts were among the participants.



National Seminar "Economic Insight: The Way Forward"

Economy plays a vital role in the development of any country and to analyze the current state of economy of Pakistan a national seminar was held, titled "Economic Insight: The Way Forward" in July 2019, where President of Pakistan H.E Arif Alvi honored the session as a chief guest. To look at the macro-economic challenges and to discuss in detail the root causes of slow growth, the session was followed by two roundtables;

- "Macro-Economic Challenges and a Way Forward by Dr Ashfaque Hasan Khan, Principal S3H
- Pakistan- India Trade Relation" by Dr Salman Shah, Advisor to Chief Minister Punjab

The main theme was centred on appraising various dimensions of Pakistan's macroeconomic sector and prospects for the country's trade in the region, especially with India; measuring strengths and weaknesses of economic policies; and generating some fresh thoughts and workable ideas through an inclusive discourse by the experts and other notable participants.



Health Concerns of the Textile (Weaving) Workers & the Associated Community

This project by NUST researchers is focused to establish the association between the septic environment of the weaving industry with the associated diseases and to explore the impact of ill health of the workers on their families or associated community. The population for the study consists of workers from the weaving industry of Kasur, a district near Lahore, Pakistan. The study counts on the stratified random samples to select both the treatment and control group from different union councils of Kasur. A well-structured questionnaire based data collection was planned to explore the diseases associated with the weaving industry and its impact on the families of the workers (associated community). Suitable econometric models (like logit/probit) were applied to study the determinants of ill-health of the workers and the associated community.

An Exploratory Study of Operational Models, Impact, and Best Practices of Business Incubation Centres for Tech Start-ups in Pakistan

Business incubation centres have been recognized globally to boost entrepreneurial activities in the economy and to contribute to technological advancement and economic development. Pakistan is an emerging market with good technological infrastructure and a large pool of talented youth, which exhibits a tremendous business growth potential if institutions may strengthen the entrepreneurship culture in the country. In Pakistan, business incubation phenomenon is at early stages of implementation comparing to advanced economies. Since last few years, public and private sector organizations are putting efforts to establish different non-profit and for-profit incubation centres. These numbers are far less than the country's economic development requirements to nurture new start-up enterprises. Hence, there is a need to extend incubation capacity of existing incubation centres, making less-functional incubators completely functional and established more incubation centres in different regions of Pakistan. It requires an understanding of recent state of business incubation process in the country. Nevertheless, little is known about business incubation phenomenon in Pakistan, such as existing incubation models and their best practices, impact of incubation services on start-up firms, incubation services requirement of incubatees, existing opportunities. This research project, conducted at NUST Business School, aims to investigate operational models, impact, opportunities, challenges, and best practices of business incubation centres in Pakistan to improve effectiveness and efficiency of business incubation ecosystem.





GOAL 9

Industry, Innovation, and Infrastructure

1742

Research Projects

233

Publications

519

Patents

1

IPR Licensed to
Industry

National Science and Technology Park (NSTP)

41 startups, 17 SMEs, 6 Anchor Tenants, 20+ Industrial Mentors

National Science & Technology Park (NSTP) is the first fully integrated science and technology park (STP) and the first STP of the country; the initiative is meticulously aimed at kindling the knowledge economy of Pakistan by stimulating and nurturing innovation-led germination and growth of hi-tech entities. NSTP, inaugurated on 9th December 2019 by the Prime Minister of Pakistan, H.E. Mr. Imran Khan, is the new national tech-pad where entrepreneurs and multinationals come together to discover, ideate, create, collaborate and break new ground. Kicking off with a portentous pilot, the NSTP is home to an ornate assortment of tech start-ups, established R&D companies and research branches of renowned national and international industry leaders.



Licensed to Industry

Industry: Arraytech

NUST transferred 1 X IPR of “S-Band TRR Module for Phased-Array Radars” to the local Industry, Arraytech. The project was related to the development of a Transmit-Receive-Receive (TRR) module for phased array mono-pulse radar for ground-based systems. This radar technique enables target detection with a single pulse, as opposed to conventional techniques of emitting multiple pulses in different directions and looking for maximum return. The team worked on sub-modules such as transmitter chain, high power amplifier, receiver chain, power supply, embedded system and mechanical chassis finally culminating into an integrated packaged system. The project was a successful indigenization effort for potential use in air-traffic control and surveillance applications through an academia-industry partnership between RIMMS-NUST and RWR (Pvt.) Ltd.



Faculty Placement 2019

**21 faculty members, 11 Industries,
342 Industrial Research Projects Secured**

NUST placed 21 faculty members in 11 industries from 14 institutions for two weeks during the summer breaks, under its Faculty Placement Programme in the year 2019. The programme enabled NUST to secure 48 internships, job positions and 14 professional training. On reciprocal basis, two members from each industry visited NUST for three days that resulted in furthering relationship with these industries. For the year 2019, 342 projects focusing on industrial needs, were secured from industries to be considered as Final Year Projects.

Industry-Academia Linkages

**800+ Industrial Partnerships, 36 Technologies licensed to
Industry, 100+ Industrial Consultancies/30+ Joint Research
projects with Industry**

At NUST, we strongly believe in knowledge transfer and open innovation to meet industrial needs. NUST has formulated an integrated, interdependent ecosystem that helps in establishing and consolidating industry-academia linkages and subsequently in commercializing research. The parts of this eco-system are:

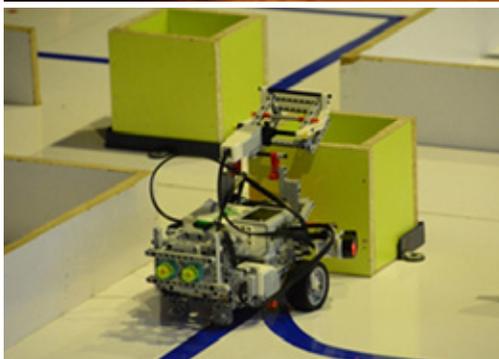
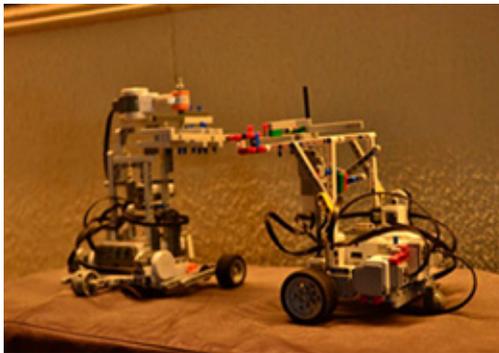
- Corporate Advisory Council (CAC)
- National Science & Technology Park (NSTP)
- Directorate of Research
- Intellectual Property Office (IPO)
- Technology Transfer Office (TTO)
- Professional Development Centre (PDC)
- Industrial Liaison Office (ILO)

All of the above organs play a key role in establishing collaborations with industry and bridging the gaps between industrial needs and academic research.

National Engineering Robotic Contest (NERC):

**14 years, 1600+ Teams from all over Pakistan,
7000+ Students' Participation**

College of Electrical and Mechanical Engineering (E&ME) is one of the leading constituent colleges of National University of Sciences and Technology (NUST). Department of Mechatronics at NUST, College of E&ME has been organizing this event for the last 14 years. The contest provides a great learning opportunity and exposure, assists in capacity building of youth, girls and students from all over Pakistan, even from remote areas, to learn about advance fields of Robotics and automation. So far, the contest has been able to attract talent from all over Pakistan and provided a platform to showcase their talent. A nominal fee is charged for participation, and all the funds for the event are arranged by NUST, with partial funding by supporting organizations and industries.



NERC SNAPSHOT 2003-2019



NUST Cyber Security Auditing and Evaluation Lab (NCSAEL)

NCSAEL is a part of the National Centre for Cyber Security (NCCS), one of the 4 national centres of excellence being established at Pakistani universities under an initiative of the government of Pakistan. NCCS aims to develop advanced tools and research technologies to protect Pakistan's cyberspace, sensitive data, and the local economy from cyber-attacks. NCSAEL is envisaged to be an internationally recognized lab and the nation's first source of expertise in the field of Information Security, with a focus on carrying out a security assessment of existing IT applications/OS, malware analysis for detection of Advanced Persistent Threats (APTs) and development of specialized secure indigenous IT products/services.

The lab will also help organizations in preparation for IT security product evaluation before they formally apply for the internationally recognized Common Criteria Testing Lab's (CCTL) assessment.

Finding Innovative & Creative Solutions for Society (FICS)

2014-19

No. of Ideas Submitted: 1350

No. of successful startups: 28

NUST strongly believes in inculcating the spirit of entrepreneurship and innovation among students to tackle modern-day challenges head-on. Finding Innovative & Creative Solutions for Society (FICS) is an annual competition hosted by NUST in which students from around the country present their ideas and prototypes for funding and commercialization. This initiative aims to instill a spirit of social entrepreneurship amongst students, encouraging them to convert their creative ideas into value-adding solutions and thereby benefit themselves and society. The three-stage competition spans over two months in which projects are examined by industry leaders, innovators, and investors.

Some of the objectives of FICS are given below:

- To encourage students to become valuable members of society and contribute to societal / community development by deploying technical knowledge and scientific tools.
- To allow students to think creatively and develop the latest applications and innovative technology based-solutions, hence encouraging them to work on practical utilization of knowledge.



FICS SNAPSHOT 2014-2019

Year	FICS 2014	FICS 2015	FICS 2016	FICS 2017	FICS 2018	FICS 2019
Stage 1 - Idea / Synopsis Submission						
Project Synopses Submitted	77	179	263	205	328	298
Projects Shortlisted for Stage 2	56	103	183	122	306	131
Stage 2 - Standee, Presentation & Video						
Projects Displayed	56	79	93	122	137	90
Projects Shortlisted for Stage 3	38	57	61	52	54	35
Stage 3 - Prototype Display						
Projects Presented	29	54	57	49	47	34
Winners	3	5	5	4	3	9
Successful Start ups	-	4	3	6	9	6

International Conference on Nanoscience and Nanotechnology (ICONN)

International Conference on Nanoscience & Nanotechnology (ICONN) - a joint venture of NUST School of Chemical & Materials Engineering (SCME) and LUMS SBA School of Science & Engineering (SBASSE), was held at NUST. Various international speakers including Prof. Dr Mathias Brust (University of Liverpool, UK), Prof. Dr Walther Schwarzacher (University of Bristol, UK), Prof. Dr Churl-Hee Cho (Chungnam National University, Korea) & Dr Jan-Henrik Smatt (University, Turku, Finland) delivered lectures in interactive sessions on Nanomaterials for environmental remediation and monitoring, renewable energy technologies, bio-nanotechnology, porous materials, nano-devices and nanocomposites.





GOAL 10

Reduced Inequalities

10

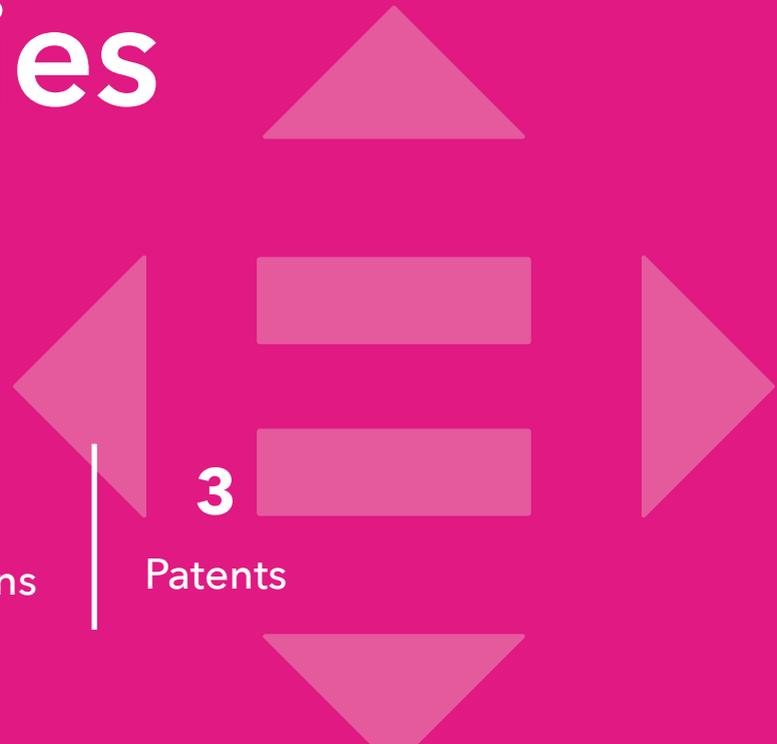
Research Projects

18

Publications

3

Patents



Non- discrimination policy

NUST imposes a strict, non-discrimination policy for reducing in-equalities due to gender, race, marital status, ethnicity, religion, financial background, disabilities, and sexual orientation. The policy, which emphasizes on merit, applies to all matters of university employment, administration, admission to university academic programmes and other activities.

NUST Disability Redressal Policy

Disability covers various physical and psychological impairments that pose a challenge to the functionality of a person, affecting his/her ability to carry out day-to-day tasks. Disability may be associated with long-term health issues, thus requiring rigorous management which impediments a person's participation and productivity as an individual and member of society. Social barriers and lack of facilitation may be a hindrance to effective participation on an equal basis with others.

NUST constituted "National Disability Redressal Committee (NDRC)" to review existing infrastructure and practices and recommended plans to make NUST disability-friendly institution. Previously, students or staff with a disability was duly facilitated upon need and request. However, there was a dire need for policy and formation of dedicated committees/structures to streamline the assistance and facilitation process for students/staff with disability, hence NUST introduced this policy for redressal of disability into the following categories:

- o Admission
- o Curriculum & Examination
- o Rehabilitation/Employment
- o Addressing Temporary Disability
- o Disability Awareness and Staff Development
- o Infrastructural Changes
- o Constitution of Disability Redressal Committee



Under Graduation Awareness Drives

2019: 21 Cities, 51 Institutes, 11,820 Students Outreach

NUST believes that education is the only tool to bridge not only economic inequalities but also cultural inequalities. NUST UG Awareness Drives are conducted on the request of different educational institutes in order to guide students regarding NUST and its Under Graduate Admissions Procedure. It also focuses on promoting awareness on the importance of higher education and encourages talented but underprivileged students from remote areas of Pakistan to apply for various undergraduate programmes.

NUST Outreach Programmes

Year	Conduct of Classes	Classes Attended by Students of		
		Federally Administered Tribal Areas	Balochistan	Interior Sindh
2017	3 Jul - 25 Aug	73	78	-
2018	20 Jun - 21 Jul	143	74	-
2019	10 Jun - 12 Jul	103	89	65

3 Yrs., 625 Students from remote areas coached on NUST Main Campus

NUST launched its Outreach Programme in 2017, with objective to synchronize the raw talent and refine the faculties of the promising students hailing from underprivileged areas of the country to

join mainstream universities for pursuing their academic career.

Students belonging to remote areas like Sindh (All districts less Karachi, Hyderabad and Sukkur), Khyber Pakhtunkhwa (KPK) and Balochistan are eligible to apply.

The programme is intended to coach the qualified students of High School students to prepare for NUST Entry Test. The duration of the training is 4-6 weeks during summers, at various centres. Following facilities are provided to the selected students, free of cost, during the training: -

- Boarding and Lodging
- Stipend
- Stationery / Photostat / Guide Books
- Medical Facility / Hygiene Kit
- Laundry
- Sports Gadgets

NUST also offers Need-Based Scholarships to deserving selected applicants. From 2019 onwards, campus in Balochistan also started enrolling students in UG programmes, which is a laudable step of NUST for ensuring social inclusion.

Need-Based Financial Scholarships for Students

Total 2317 Scholarships awarded 2015-19

Need-Based Financial Aid Programme aims to make NUST education affordable and accessible to the most financially challenged students, admitted purely on merit. The programme is bolstered by NUSTs' own resources and external funding, seeking to facilitate students from low and middle-income families. Need-based financial aid is offered to Undergraduate and Masters students in various forms like tuition fee coverage, interest-free loans, deferment of tuition fee, and fee deposits in installments.

Seminar on developing acceptance of disabled and physically challenged individuals

A seminar on "Developing Acceptance of Physically Challenged Individuals" was organised by NUST Centre for Counselling and Career Advisory (C3A) NUST Campus in Feb, 2019. The seminar aimed to raise awareness about the rights of the physically challenged and how these valuable individuals could be integrated into society and ensure their inclusion in the mainstream of the economy.



Sports day celebration at Aghosh orphanage by NCSC

Members of NUST Community Service Club (NCSC) volunteered to visit the Aghosh Orphanage and organize a sports gala to spend quality time with the children. The volunteers engaged the children in a sports tournament in which they played football with each other and competed in teams in a friendly competition. The overall temperament of the NCSC team members helped ensure a positive environment for the miniature tournament followed by a photo shoot with props that had been themed around famous football.



Orphans Know More Visits at Aghosh orphanage

i. Library

Books are a magical portal that transports the reader into a realm where all dreams come true and the sky is never the limit. Since hundreds of years (yes, books weren't commonly available until the printing press' advent), they have captivated both adults and children alike.

The bright students at Aghosh Al-Khidmat Orphanage have an unquenchable thirst for knowledge and a curiosity for the beautiful and complex world around them. In 2019, NCSC's project "Orphans Know More" inaugurated a library at the Orphanage itself to provide the children with the best source of traditional, proven learning and inculcate a habit of reading. The books were collected through donations and comprised of every category needed for growing minds, including books in both English and Urdu, fiction and non-fiction as well as dictionaries, atlases and encyclopedias.



Orphans Know More visit at Apna Shelter Home

NUST Community Services Club's members visited Apna Shelter Home, an orphanage in Islamabad, under their project of Orphans Know More. The following activities were planned for the children:

- The kids were engaged in multiple recreational and team building activities like making origami jumping frogs, frog race amongst origami models, question and answer session, human tic-tac-toe etc.



Unraveling the contextual Realities in Post-Conflict North Waziristan Agency (NWA)

Understanding displacement, resettlement and post-conflict Development

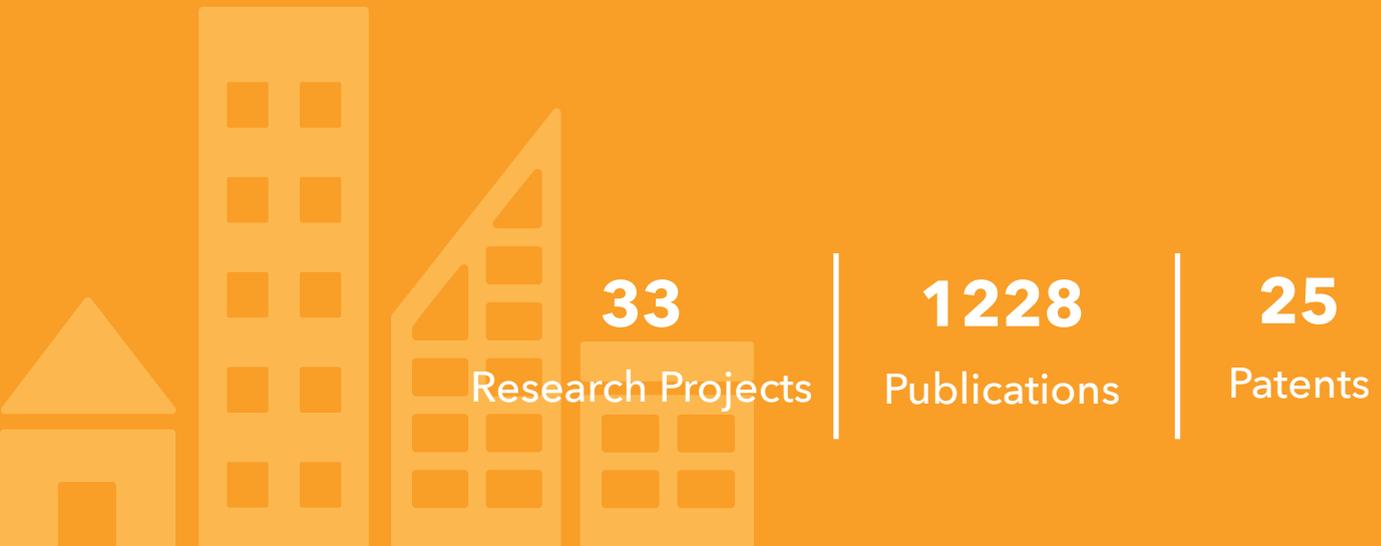
Keeping in view the case under study – North Waziristan Agency (NWA) – this research project by Dr. Mohammad Makki at Centre of International Peace & Stability (CIPS) pivoted upon the study of two social processes, centred on the Internally Displaced Persons (IDPs) in particular: conflict-induced displacement and post-conflict resettlement. The research studied the post-conflict development in NWA as planned social change from 'relief to development', to bridge the inequalities resulting as a result of the conflict.

In order to contrive the aforementioned undertaking, the experiences, perspectives and narratives of the IDPs, actors and factors crucial for this task were collected during and after the displacement and resettlement processes. The role and experiences of the civilian administration of working in collaboration with the armed forces, foreign and local aid agencies involved in relief camps for the IDPs to facilitate post-conflict liberal peacebuilding in NWA, were analyzed. And for this, views and experiences of the Pakistan Army stationed at NWA on their 'transformed' role from kinetic-led agendas to humanitarian and developmental initiatives which are outside its conventional mandate, are crucial for this study. Such an analysis enabled us to identify the gaps and best practices in the policy and practice towards post-conflict development.



GOAL 11

Sustainable Cities and Communities



International Seminar and Workshop on Seismic Performance and Health Assessment of Civil Engineering Structures



A two-day International Seminar on 'Seismic Performance and Health Assessment of Civil Structures' was held at NUST Institute of Civil Engineering (NICE) in collaboration with Higher Education Commission (HEC) and Pakistan Engineering Council (PEC), to update knowledge of industry professionals regarding Structural Health Assessment and Performance-based Design of Structures. During the seminar, a series of insightful speeches and panel discussions were held by various foreign and national Academic & Industry experts. The seminar also constituted workshop and sessions on performance-based design.

Smart Traffic Profiling for Intelligent Road Transportation

This project by NUST researchers explores two non-intrusive approaches to traffic sensing – LiDARs and cameras – that can be mounted on poles or gantries above the road surface, and hence require minimal maintenance and no road closures or excavations for installation. During the project, several low-cost LiDAR sensors will be experimented with leading commercial systems for ITS applications, their cost analysis and alternate low-end options from the ADAS applications / self-driving auto industry. The system would be able to achieve the following to optimize traffic profiling:

- Simultaneously detect, count and accurately classify multiple vehicles on the highway into one of a predefined set of categories.
- Perform vehicle axle profiling, i.e. to count the number of axles and sense their spacing and arrangement
- Estimate the speed of approaching vehicles and their direction of movement.
- Vehicle height estimation for the purpose of clearance measurement

Assessing Physical and Infrastructural Vulnerability to Urban Flooding: A Case Study of Pakistan

Climate Change has caused tremendous damage to urban infrastructures due to disasters such as flash flooding and related disasters. This calls for resilient infrastructures and early warning systems for effective disaster management.

The main objective of this project is to reduce human and socioeconomic impacts of flooding and to improve the living conditions of the populations in Pakistan. This project by NUST researchers defines indicators and develops an index for the physical and infrastructural vulnerability of flood-prone urban communities and suggests measures and strategies for effective flood disaster risk reduction. It also proposes actions that minimize flood damages and accelerate early response to floods.

Public Safety Communications in the Context of Terror Attacks (Counter-Terrorism)

Public safety and crime prevention are the key characteristics of a smart community. NUST researchers collaborated with Northern Alliance Treaty Organization to provide innovative answers and solutions to the problem to reduce the response time in the context of terrorist attacks. For this purpose, research and development in Pervasive Public Safety Communication (PPSC) were carried out to enable connectivity-aware, autonomous, cooperative, reliable and real-time communication for resource constrained PPSC.





GOAL 12

Responsible

Consumption and

Production

6

Research Projects

477

Publications

36

Patents



Waste Sorting at NUST

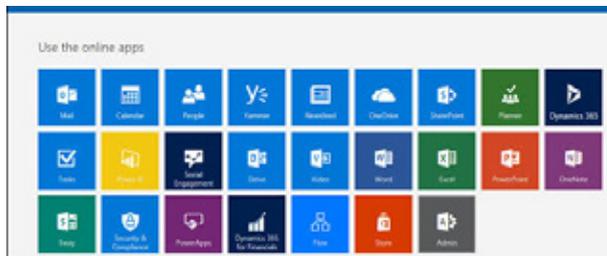
NUST is working to reduce waste and promote efficient recycling and reuse for a sustainable environment. NUST has installed color-coded dustbins in all cafeterias where waste is sorted into plastics, paper, and glass to facilitate faster recycling, with the collaboration of a private recycling firm “Pappu Recycles” under Saaf Sutthra Sheher initiative, with the help of one of our Millennium Fellows.

Color coding helps waste disposal companies distinguish different types of wastes, and easily sorts them into different categories. This initiative has encouraged adopting recycling a major part of the Institution’s operations and management.



NUST launches E-Office

In order to reduce paper-work, an online minuting system “NUST E-office” has been launched since July 2019 for paperless processing. This has not only made internal processing time extremely efficient but has also reduced the use of paper in each office, resulting in huge savings of paper and resources.



Ban on Plastic Bags

NUST actively promotes environment-friendly practices at all of its campuses. The use of plastic bags at all stores inside NUST was banned on account of their negative impact on the environment and has long been replaced by eco-friendly alternatives.



Circular Fiber: NUST Paper-Recycling Machine

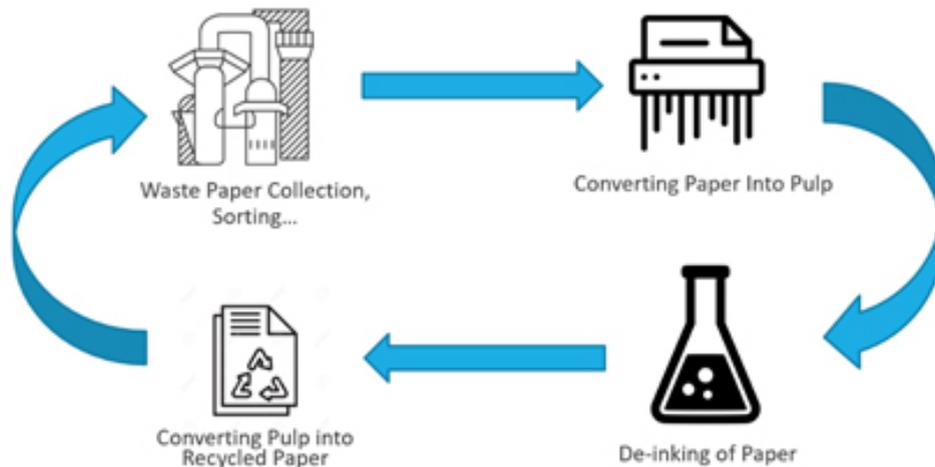
A total of 15 tons is supplied to the schools per annum and around 4-5 tons of paper wastage is collected yearly from all the schools. The paper waste in NUST includes regular letters, newspapers, research documents and exam sheets etc.

Paper used in the examination sheets are recycled to reduce paper wastage and making more environmental friendly procedures, but the rest of the paper is either burned, collected and dumped whereas classified documents are shredded in a shredder.

NUST invested in the development of an indigenous paper-recycling machine for recycling waste paper of NUST and also of other neighboring universities. Considering the factors of global warming, expensive machines and problems of sending papers to be recycled to off-site plants, NUST engaged its students in a project to develop an economical and compact paper recycling machine for our organization. The project has the following stages:

- Design and Manufacturing of paper recycling machine
- Converting waste paper to pulp
- De-inking of waste paper and forming.

So far, a prototype has been developed and the industrial-scale machine will be fully developed and deployed by the end of 2021.



Recycled Road

Recycled Road is a project by one of our Millennium Fellows 2019 that aims to repurpose plastic waste to building roads. When building roads, the materials of construction required are concrete, sand and petroleum derived bitumen. In Pakistan, we have limited resources of workable plants of petroleum refinery from which bitumen can be extracted. So to compensate the needs, we are compelled to import bitumen product from various countries. By using solid plastic waste for this purpose, the project aims to improve waste management and provide cost-effective infrastructure development to cities, suburbs, rural areas, and slums.

Filler Up

Filler Up is a project by NUST Millennium Fellows 2019, which aims to educate people to be cognizant of their individual and collective impact, especially as it pertains to waste generation consumption and sustainability. It provokes people to take a real hard look at what they buy, why they buy it and where they buy it from. It is imperative that we understand how we can sustainably satisfy the expectations of the growing global middle class which stem from a certain consumerism-centric version of global culture.



Efficient Recycling of Machine Waste by Laser Deposition

The project has been completed by NUST researchers to develop a method to allow the chips produced by the milling and turning of ferrous metals to be quickly recombined into usable solid blocks. This has the wider objective of increasing the material and energy efficiency of manufacturing of components from ferrous metals for ecological benefit.

The project has successfully demonstrated the full process of beginning with a solid block of metal, machining it into discrete chips and then recombining those chips into a solid. The wider objective of the project was increasing the material and energy efficiency of manufacturing of components from ferrous metals for ecological benefit. Tests using 'multiple recycling' show it is possible to approach 100% material efficiency with the method.





GOAL 13

Climate Action

16

Research Projects

156

Publications

32

Patents

NUST Green Campus Initiative

2 Plantation drives per annum, 14k+ Saplings planted in 2019

In line with its commitment towards university social responsibility, NUST endeavors to follow environment-friendly practices, and arranges frequent plantation drives across all its campuses spread in different cities of Pakistan. By doing so, not only does the university contribute to the betterment of society and adhere to UN SDGs, but also sets examples encouraging others to make an effort. Over the past decade, NUST, in compliance of its green campus policy, has planted 97,000 saplings across its Islamabad campus alone, including 14,000 saplings in spring and Monsoon drives in 2019. Such efforts have transformed Sector H-12 from a barren land to a lush green campus that is home to approximately 9000 students, faculty and employees.

Spring Plantation Drive

1300+ Saplings Planted

NUST Green Campus Initiative is one of the signature initiatives of NUST under which 2 plantation drives every year are organized to fight climate change. In 2019, the Spring Tree Plantation Drive was inaugurated by Rector NUST, who planted a grapefruit sapling to mark the occasion. An overwhelming number of university officials, faculty members and students were also present. While speaking to the gathering, the Rector emphasized how horticultural activities are imperative for conserving the green environment and ameliorating the harmful effects of climate change. He encouraged the students and faculty to not only actively participate in the campaign on campus, but also take that to their homes and surroundings, for which the saplings would be provided by the university. During the drive, over 1300 saplings, including Citrus, Loquat, Celtis and grapefruit were planted at different locations on campus.

Earlier in the day, a Marathon was also arranged on campus. NUST students, children, and elderly people all took part in the race with the same enthusiasm. Towards the end, Rector NUST awarded prizes to the winners of different categories.



“Plant4Pakistan” Day

200 Saplings planted in NUST H12 Campus

NUST believes that the calamity of Global Warming can only be stopped if every single one of us comes together to not only plant more trees but also adopt an overall eco-friendly lifestyle, ensuring a cleaner and greener future. NUST, in line with the Prime Minister’s appeal to all Pakistanis, to celebrate August 18, 2019, as “Plant4Pakistan Day”, became part of this largest country-wide afforestation drive, by organizing on-campus plantation, in which NUST students, faculty, employees and their families participated enthusiastically. Eager to play their role in fighting Climate Change in the region and respond to the call by PM Imran Khan, NUSTians planted around 200 saplings of various kinds at the NUST H-12 Campus, Islamabad.



NUST holds Int'l workshop on "The Role of Artificial Intelligence in Environment Monitoring"

Attended by renowned academics and researchers from China, Germany, Japan and Sweden, the workshop was held as part of 3rd IAPR Summer School on Document Analysis being conducted at NUST in August 2019. Discussions were held around a dire need to construct more water reservoirs and simultaneously maintain an ecological balance through robust afforestation to avert the climatic and environmental degradation issues facing Pakistan.

The instrumental role of NUST as the leading hub of research and innovation in tackling the core environmental problems through technological intervention was also elaborated upon.



Solar Powered Shuttle



Climate changes pose one of the greatest threats to our planet. Of the environmental risks identified by the World Economic Forum in its annual Global Risk Report, four can be linked to climate change: extreme weather events, failure of climate change mitigation and adaptation, natural disasters, and biodiversity loss and ecosystem collapse. NUST is committed to reducing greenhouse gas emissions and cutting down carbon footprint for a sustainable environment.

At a campus spread over 700 acres, commuting has been a hectic activity for the students and staff at NUST. Therefore, to facilitate a zero-emission commute within more than 20 solar-powered shuttles were acquired by the administration to provide eco-friendly commute for students and staff.

Exploring the spatial extent, causes, composition and intensity of winter smog over plains of Punjab, Pakistan

An increasing trend in fog frequencies over Pakistan has been witnessed during the winter span for the last few years, which has stemmed in vast disruptions in the day to day lives of people across the state. Intensive episodes of winter fog results in massive economic losses comparable to numerous other extreme weather happenings such as hurricanes, storms, and tornadoes.

The research by NUST Institute of Environmental Sciences and Engineering aims to examine the degree and extent to which climate change and atmospheric pollutants may accelerate the formation of fog in Pakistan. It studies reasons, variations, and causes of smog formation and also studies the composition of smog in different areas of Punjab, through sensors, to propose an effective area-specific localized solution to the smog issue.





GOAL 14

Life below Water

3

Research Projects

101

Publications

2

Patents

CoralSense: An Underwater Wireless Sensor Network for Monitoring Coral Reef Environment

Corals are one of the underwater species which has been immensely affected by rising sea temperatures and water pollution. Globally, the risk of coral bleaching (both moderate and severe) has increased at a rate of 4% per year, with 8% of reefs being affected by bleaching per year in the 1980s and 31% being affected in 2016.

NUST has committed to preserve the natural habitats, underwater ecosystems through research and technology, and has set an example of effective collaborations to materialize such efforts.

NUST researchers, in collaboration with Umm Al-Qura University, KSA, are currently working on the development of an Underwater Wireless Sensor Network (UWSN) lab to be the first specialized underwater sensor network lab, to support marine research and industry in the kingdom. The objectives of the collaboration are to design, develop and deploy a prototype UWSN for visual monitoring of coral reefs in the Red Sea.

Automatic Detection and Classification of underwater Man Made Object (MMOs)

The detection and classification of underwater objects is an important problem in a variety of naval and marine applications. Classification and detection of MMOs are traditionally carried out by a skilled human operator due to its difficulty. This is especially true for underwater environments where the variety of ambient noise present makes extraction and classification of relevant audio data a challenging task.

The general approach for detecting targets is a two-tier process:

- Detection of possible naturally occurring and man-made objects
- Classification into naturally occurring or man-made objects with a low detection rate of false alarms.

Researchers at Pakistan Navy Engineering College (PNEC), a constituent college of NUST based in Karachi, have proposed a solution that develops a characteristic feature vector-based technique in conjunction with optimized machine learning and data mining techniques to carry out automatic classification of underwater images using collected data. The project will be deployed in coastal areas of Pakistan to detect and analyze the under-water conditions of the coasts.

An underwater scene featuring a vibrant coral reef on the right side, with various colorful fish swimming around it. The water is clear and blue, with sunlight filtering through from the surface. On the left side, there is a dark, semi-transparent overlay containing text.

Development of a nondestructive approach to detect marine life in the freshwater of Pakistan

Researchers at NUST collaborated with Pakistan Museum of Natural History (PMNH) to collect fish data samples from different locations in Pakistan. The aim of the study was to develop a computer vision based algorithm for detection of fish species from the captured video frames by using background detection and foreground extraction and ultimately, classify fish species from collected imagery with the help of machine learning algorithms. The project also developed an easy to use Graphical User Interface (GUI) tailored for the dedicated task of generation and management of fish species detection.

The project was deployed by PMNH for data collection and classification of local under-water species of Pakistan. The collaboration was an example of cross-sectoral deployment of NUST expertise for the restoration of environment and preservation of under-water life.



GOAL 15

Life on Land



9

Research Projects

328

Publications

13

Patents



NUST Plantation Drives to Preserve Environment and Natural Habitat

2 Plantation drives per annum,
97k+ Saplings Planted,
338 Acres of Green Land,
80 Acres in forest,
Dedicated Horticulture office

NUST is trying its best to increase awareness on preserving ecosystems by organizing programmes as well as taking initiatives to defer the rate at which ecosystems for wildlife are being destroyed. A dedicated horticulture office has been established at NUST which looks after landscaping, plantation and horticulture if NUST H12 Campus.



2 massive plantation drives, one in spring and one during monsoon, are organized every year, in which hundreds of saplings have been planted all over NUST since 2008. Apart from that, the plantation is organized at different occasions like orientations, semester ends, summer, international visits, chief guests and all other important events. These drives, aiming to restore the habitat of wildlife within NUST, are also aligned with the Prime Minister's Clean and Green Pakistan Initiative.

NUST Main Campus offers 338 acres of green land, out of which 80 acres is covered in forest, which provides habitat to several wild animals such as fox, porcupines, cats, dogs, mongoose, pigs and many more. Apart from forests, lakes situated inside the campus attract several bird species such as sparrows, francolins, kingfishers, and drakes, etc.



NUST Environmental Club (NEC)

NUST Environment Club (NEC) was proudly launched at NUST H-12 Campus back in 2011 to celebrate nature and create awareness on environmental issues that are challenging the fate of planet Earth. The purpose of NEC has been to instill a sense of collective and individual responsibilities in the community towards protecting the environment and to inspire people into innovating and reforming their lives to eco-friendlier alternatives. NEC hosts exclusive events, sessions, blogs and much more to interact with its audience and is one of the most active societies thriving at NUST. Some of the events NEC successfully held are NEC Earth Day Carnival, Cycling Competition, Waste Reduction Week, etc.



Forest Monitoring and change detection using remote sensing data

The researchers at NUST are developing a system that is able to quantitatively monitor forests of Pakistan. Specifically, the goal of the research is to deploy a small low-cost UAV to acquire temporal images and fuse it with available satellite imagery to enable thorough assessments of local forest conditions e.g., degradation and deforestation caused by theft, urbanization or natural factors such as arid climate, heavy dependence on irrigation water etc. by employing state-of-the-art machine learning techniques.

The developed system would not only fill in the gaps on data for the policymakers but also provide them with the vital information that is essential in ensuring sustainable management of forests.

NUST firmly believes that the work proposed in this project will lead to new opportunities for forest monitoring in Pakistan, and hence would help to raise awareness of the benefits of forests management and reduce the adverse effects of deforestation.



GOAL 16

Peace, Justice and Strong Institutions

3

Research Projects

230

Publications

3

Patents

Centre for International Peace and Stability (CIPS)

The Centre for International Peace and Stability (CIPS) was established and inaugurated by UNSG Ban Ki-moon on 13th August 2013 in NUST. It is one of its kind institute established to conduct research and training in matters related to UN Peacekeeping Operations (UNPKOs). Its mandate is not restricted to the relatively narrow field of peace-keeping, but it also offers combined graduate programmes in Peace & Conflict Studies (PCS) with short courses on pre-deployment peacekeeping training. With time, CIPS has emerged as a centre of excellence in international peace and stability with a focus on peacekeeping, peacebuilding, and conflict resolution within the context of prevailing international and regional politics.



Seminar on "Pakistan: A Misunderstood State and Countering Violent Extremism: A Community-Led Approach in the United Kingdom"

Mr. Toaha Qureshi, the Founder Chairman of Forum for International Relations Development (FIRD) and Chairman, Stockwell Green Community Services (SGCS), was invited at the Centre for International Peace and Stability (CIPS), to share his abundant knowledge, experiences, and specializations with the students and faculty of CIPS. Mr. Qureshi enlightened the audience with his unparalleled insights on the subjects under discussion for almost an hour, which was followed by a stimulating Q&A session with the audience, leaving a deeper impact on their cognizance.

Mr. Toaha Qureshi can be hailed as one of the pioneers who formulated counter-radicalization, countering-violent extremism and preventing violent extremism programmes, strategies and models for the UK government for over two decades. His work has been implemented in partnership with the European Union, Ministry of Justice, Home Office, Police, local governments and the communities at large.

Roundtable Conference on Legal and Socio-Cultural Discourse on Human Migration

Centre for International Peace and Stability (CIPS) and Hanns Seidel Foundation (HSF) jointly convened a roundtable titled, “Legal and Socio-cultural Discourse on Human Migration” at NUST’s main campus in July, 2019. The overarching aim was to produce recommendations for the policy framework that contributes to devising Pakistan’s migration management strategies. Davide Terzi, Chief of Mission, International Organization for Migration, Pakistan, graced the occasion with his presence as the keynote speaker.



Signing of a research project agreement with Hanns Seidel Foundation (Pakistan Office)

The Centre for International Peace and Stability (CIPS), and Hanns Seidel Foundation (HSF), Pakistan, signed a research project agreement focusing on post conflict rehabilitation and development in North Waziristan. Funded by the HSF, the year-long project is titled, “Unravelling Contextual Realities



in Post-Conflict North Waziristan (NW): Understanding Displacement, Resettlement and Post Conflict Development.” The project explores and analyzes the processes of displacement and inclusive rehabilitation where all stakeholders synergize their efforts to achieve a unitary objective.

Round Table Conference on Dynamics of Forced Migration in Pakistan Addressing Internal Displacement and Refugee Movements

A roundtable titled, “Dynamics of Forced Migration in Pakistan: Addressing Internal Displacement and Refugee Movements” was convened by the Centre for International Peace & Stability (CIPS) in co-operation with Hanns Seidel Foundation (HSF), Pakistan Office. The gathering was graced with the presence of Mr. Igor Ivancic, Assistant Representative (Protection) at the United Nations Higher Commissioner for Refugees (UNHCR) as the keynote speaker.

The keynote speaker and other presenters gave pertinent remarks highlighting the plight of the forcibly displaced populations and the need for systematized policy-making with contextual considerations. Drawing from the roundtable conference, the broad consensus crystalized that Pakistan’s management of the internally displaced and the refugees should be promulgated on more visible forums since Pakistan has extensive lessons and experiences to offer for countering the challenges posed by forced migration.





GOAL 17

Partnerships for the Goals

10

Research Projects

517

Publications

5

Patents

International Memberships National Science and Technology Park (NSTP)

NSTP strives to forge partnerships with like-minded institutions and organisations, that can serve the overall national interests of promoting Science, Technology and Innovation; training and grooming scientists, technologists and engineers to become drivers of change through innovative products and services; providing foreign markets to Pakistani innovators and entrepreneurs and opening doors to the Pakistani market for overseas innovators and entrepreneurs; facilitate joint ventures and partnerships between enterprises from different industries or countries; and more.

NSTP is a member and in strategic alliance with the following international organizations:

International Association of Science Parks (IASP)

IASP is a worldwide network of Science & Technology Parks having 347 members from 77 countries. NSTP is the only full member of IASP from Pakistan.



Asian Science Park Association

ASPA is an international nongovernmental organization established in Japan in 1997 for the purpose of accomplishing the joint development in the fields of scientific technology, industry and economy in the Asian region.



World Technopolis Association (WTA)

WTA is a multilateral international organisation created with the purpose to connect the advancement of science and technology with local development. NSTP is the only associate member of WTA from Pakistan.



Inter-Islamic Network on Science & Technology Parks (INSTP)

INSTP is a platform for technological development among Muslim countries. NSTP is member for INSTP as well as the only Pakistani member of its Executive Council.



International Business Incubator (IBI) Beijing, China

International Business Incubator (IBI) Beijing, China, also known as Zhongguancun Science and Technology Park. It is the most intensive scientific, education and talent resource base in China.



iAccelerate, Wollongong, Australia

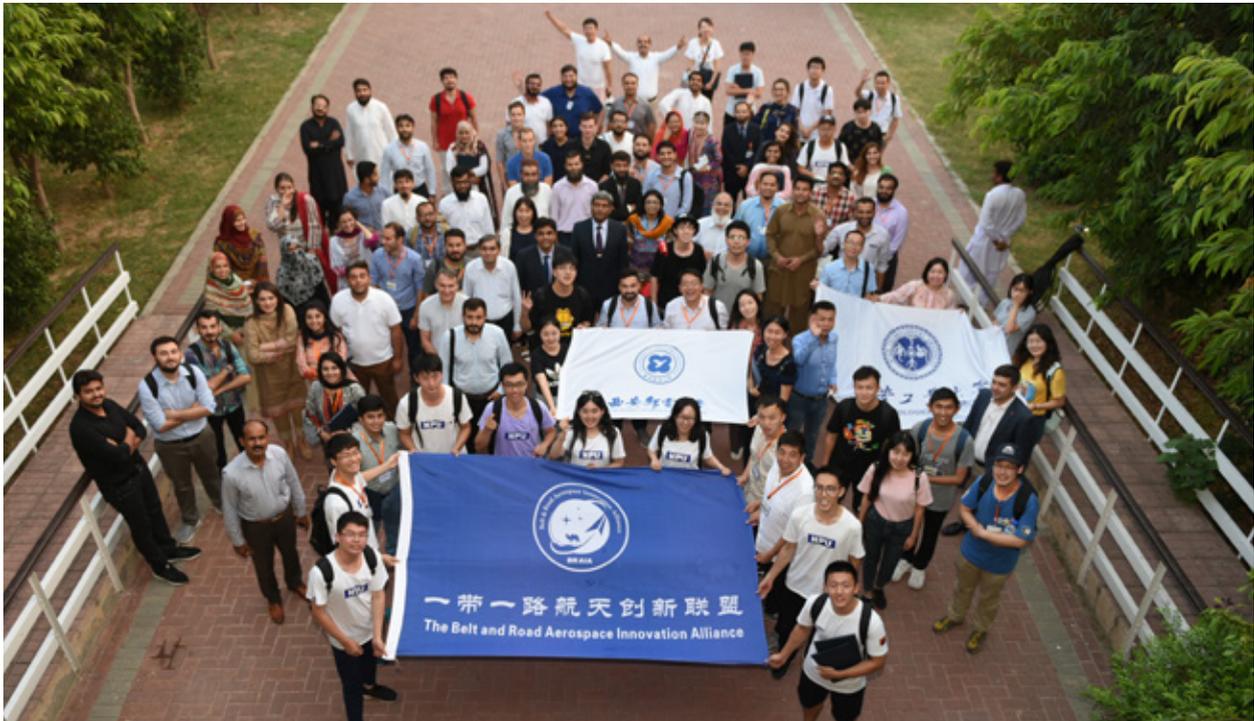
iAccelerate one of the leading and unique business accelerator and incubator programme run by the University of Wollongong (UOW)). It's a thriving community of like-minded entrepreneurs with vision, purpose and passion, offering a unique eco-system with exceptional education, mentoring and support.



BRAIA Comes to Pakistan

NUST constituent school Research Centre for Modelling & Simulation (RCMS) hosted the first largest international, 3rd BRAIA Summer Camp in July 2019. BRAIA is The “Belt and Road” Aerospace Innovation Alliance (BRAIA), an international organization, formed by universities, research institutes, and academic organizations, in the aerospace field. It was initiated by Northwestern Polytechnical University, China and Chinese Society of Astronautics. The alliance was officially established in Xi’an, in April 2017. Currently, it comprises of 51 members including USA, UK, France, Spain, Belgium, Italy, Algeria, Egypt, Ukraine, Russia, China, Pakistan, Bangladesh, and Australia.

NUST is the founding member of BRAIA and part of General Council meeting. The decision making framework of BRAIA has been modelled on the United Nations, with a General Council and a smaller Standing Council. The standing council of 15 includes 6 non-Chinese members from among the 22 overseas members. Through active participation and contribution in various activities, NUST has been elected as a member of the standing council for 5 years. This brings a great feather in the cap of NUST under China-Pakistan Economic Corridor (CPEC) collaborative framework.



NUST Collaborations with International Associations

NUST believes in establishing collaboration with international bodies for the capacity building, shaping future leadership, and preparing youth for the multi-dimensional global challenges. NUST has been collaborating with International Association for Exchange of Students for Technical Experience (IAESTE) foreign interns since 2013 as well as International Association of Students in Economic and Commercial Sciences (AIESEC) for students' exchange programmes.

So far NUST has hosted fourteen international students in these programmes and aims to increase the numbers in the future, focusing on in-take from under-represented countries.

Apart from students' exchange, NUST has been a member of Sustainable Solutions Development Network (SDSN), SDG Accord, United Nations Academic Impact (UNAI) and Association for Advancement of Sustainability in Higher Education (AASHE) which enable NUST to propagate its sustainability initiatives, establish collaboration, and share knowledge with the global key players.



NUST Internship Programme for International Students (NIPIS)

In 2018, NUST launched its own international internship programme - NUST International Internship Programme (NIPIS) to further enhance its collaborative efforts in youth engagement and empowerment.

NUST's signature Internship Programme for International Students - NIPIS '19 - launched with a bang at



NUST Islamabad campus. Promising to deliver a high-quality internship experience to incoming students; interns belong to Austria, China, Egypt, France, Poland, Turkey and 20 other countries were provided an excellent platform for advancing their professional training and reinforcing academic learning through practical application. In total 51 foreign interns attended the programme, out of which 12 were from IAESTE (International Association for the Exchange of Students for Technical Experience), 24 from NIPIS, and 15 from AIESEC (Association for the International Exchange of Students in Economics & Commerce). The programme also included various industrial and recreational trips in and around Islamabad.





Year	2018	2019
No. of students	9	51
Nationalities	5	20



NUST Community Service Club (NCSC)

2018-19: Total 102,045 service hours

NUST has encouraged and facilitated its students to participate in community service. Therefore, a highly dedicated and active club, NUST Community Service Club (NCSC), sponsored by the School of Mechanical and Manufacturing Engineering (SMME), was established in 2007 for the sole purpose of developing a sense of responsibility, compassion, and empathy towards the community amongst the students of NUST. From a humble beginning of 35 volunteers in 2007, the club has now grown to 1000 registered members every year, 1100 registered for community service courses and an extensive network of NCSC alumni.

It is headed by a council of students, yearly selected based on past community service contributions. The council makes a yearly calendar of activities, collaborates with community partners and non-government organizations (NGOs).

IMechE UAS CHALLENGE 2019, UK

NUST team declared grand champions at the “IMECHE UAS CHALLENGE 2019” in Wales, UK Team NUST “Air Works Beta”, from Pakistan Navy Engineering College (PNEC), NUST, and Karachi won the IMechE UAS Challenge 2019 held in Wales, UK, and was declared the Grand Champions of the Challenge.



NUST participation in International Competitions

NUST believes in show-casing its students' talent on various international platforms for establishment of effective partnerships in the fields of education and research, as well as for propagation of peace and harmony, the most important pillar of UN SDGs, through science diplomacy. NUST fully facilitates and sponsors various teams for participation in international competitions and lauds the accolades its faculty and students bring back home.

Formula Student 2019, UK

NUST team of Pakistan Naval Engineering College participated in Formula Student 2019 Competition in the UK. NUST team clinched a top 10 spot in business plan presentation, ranked 40th in design and 49th in cost report, which over-all resulted in a position of 40th out of 81 global teams.



NUST partners with AIESEC

Youth speak forum

NUST Placement Office, in collaboration with the International Association of Students in Economic and Commercial Sciences (AIESEC)-Islamabad Chapter, organised a Youth Speak Forum in Oct 2018. The forum was arranged with a view to raising awareness among youth regarding the UN Sustainable Development Goals (SDGs). German Ambassador to Pakistan, Mr Martin Kobler was the keynote speaker at the event, who talked at length about the impacts of climate change and the need for tapping the renewable sources of energy. He cited the example of Germany where 38% of industries and 90% domestic consumption is on renewable energy. In contrast, Pakistan has only 1600MW generation through renewable resources. He emphasized upon youth to engage themselves in producing energy-efficient products within Pakistan and have confidence in their own capabilities instead of relying on others. He also emphasized greater investment in education, Research and Development for the country's advancement.



Global Exchange Conference

AIESEC NUST Chapter, in collaboration with the NUST Placement Office (NPO), organised the "Global Exchange Conference 19" at NUST on September 14, 2019. The conference centred around the cross-cultural exchange. It hosted more than 800 students from NUST and other universities of Islamabad, as well as industry representatives. GEC19 focused on the subject of embracing diversity, and also raised awareness about the United Nations Sustainable Development Goals (SDGs). Additionally, the conference addressed prevalent social issues like gender equality, inter-faith harmony and social acceptance. The honourable speakers included Mr. Faisal Javaid Khan (Senator), Ms. Masarrat Misbah (philanthropist, business tycoon and cosmetologist), Mr. Usman Khilji (social activist), Mr. Patrick Sohail (Christian community pro activist), Ms. Ayesha Mughal (Pakistan's first transgender lecturer), Mr. Muzamil Hasan Zaidi (Digital marketer and influencer) and Ms. Hareem Farooq (TV and film artist).





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SDGs Office, Research Dte,
Research, Innovation and Commercialisation (RIC)
National University of Sciences & Technology, H-12 44000 Islamabad

 **Twitter:** @Research_NUST

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