ENSURE HEALTHY LIVES AND PROMOTE WELL-BEING FOR ALL

Experiences of Community Health, Hygiene, Sanitation and Nutrition

LEARNING CONTRIBUTIONS OF REGIONAL CENTRES OF EXPERTISE ON EDUCATION FOR SUSTAINABLE DEVELOPMENT

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Leaving No One Behind

'Leaving no one behind' is the global aspiration of the Sustainable Development Goals (SDGs). The goals are articulated recognising that progress in different sectors are mutually dependent, and hence an integrated, yet targeted approach is required to achieve a global vision.

We are now into the second year of implementing the 2030 Agenda for Sustainable Development. The current progress report, released in July 2017, notes that the implementation must be accelerated by the member states involving key stakeholders. Although progress has been made on many fronts in health, the report says malnutrition, maternal and under-five mortality remain key challenges to date. By showing that the progress has been uneven, the report specifically calls for harnessing the power of data to effectively track the progress of the SDGs. Having accessible, reliable, timely and disaggregated data has been a major challenge in international and national systems of reporting.

UNU-IAS, as a research think tank, has made a significant commitment to contribute towards evidence-based multilateral policy processes through transdisciplinary research and capacity building. In this context, the 2030 Agenda is an important focus area for the institute.

Health is a sustainability subject with diverse intersectoral linkages across several SDGs. The scope of SDG 3 – Ensure healthy lives and promote well-being for all at all ages – is broad and ambitious. As highlighted through these case studies, sustainability education and participatory, multi-stakeholder learning and action have significant impact in improving health, sanitation and hygiene, nutrition as well as overall well-being. Health promotion through increased health literacy is an important contribution that the education for sustainable development (ESD) community can offer for the effective implementation of the 2030 Agenda and the Global Action Programme (GAP) on Education.

The Regional Centres of Expertise (RCE) network has grown over the last decade to 158 in number. The network has demonstrated, through multi-stakeholder partnerships and contextually relevant learning, that communities can effectively deal with local sustainability challenges. There is a critical need for linking such learning of local implementations with sustainable policy initiatives through systematic inquiry.

This book is an expression of the deep commitment of the RCE network partners on ESD, health and well-being towards the global sustainability agenda and a sustainable future for all. I take this opportunity to thank and congratulate every member who has actively engaged with the communities in the respective regions, and shared their experiences through this publication.

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The Preamble to the Constitution of the World Health Organization (WHO) that entered into force on 7 April 1948 defined health in holistic terms as *"a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity."* Since then, efforts have been made to place health at the centre of socio-economic development. In 1978, the WHO-UNICEF Alma Ata Declaration on Primary Health Care strongly reaffirmed the centrality of health in socio-economic development, stating that *"the attainment of the highest possible level of health is a most important world-wide social goal whose realization requires the action of many other social and economic sectors in addition to the health sector".*

Primary Health Care, as endorsed by the Alma Ata Declaration, recognises individuals and the community as full participants and beneficiaries. Very important trajectories in international human rights norms, environmental principles, Millennium Development Goals (MDGs), and the recent Sustainable Development Goals (SDGs), to name a few, have evolved to shape policy debates locally, nationally, and globally on the inexorable linkages between human health and sustainability. These linkages were the core of *Our Common Future*, the famed report of the Brundtland Commission in 1987 that served as a precursor to the United Nations Conference on Environment and Development in 1992.

The Sustainable Development Goals are anchored on the principles of "Leaving no one behind" and "To ensure healthy lives and promote well-being for all at all ages" (SDG 3). Health policies must strive to bring marginalised individuals, groups and communities from the peripheries to the core of sustainability.

This book offers fresh insights from 14 case studies by the Regional Centres of Expertise Network on ESD from different regions. The richness of its diversity, the breadth of its inter-disciplinarity, and the depth of its analyses are bound to open new vistas in the discourse and policy debates on health and sustainability.

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LIST OF ABBREVIATIONS

Abbreviation	Full form
ABC	Alliance of Border Collaboratives
ACA	Affordable Care Act
ACPE	American College of Emergency Physicians
AF	ALBA Farmers
AIAC	Américas Immigrant Advocacy Centre
AIDS	Acquired Immune Deficiency Syndrome
ANC	Ante Natal Care
APAS	Associação de Produtores Agrícolas da Sobrena
ASER	Assessment Survey Evaluation Research
ASR	Academic Social Responsibility
ATRDS	Agriculture Training, Research and Development Station
AYUSH	Ayurveda Yoga Unani Siddha Homeopathy
BCHC	Browning Claytor Health Centre
BMC	Biodiversity Management Committee
BMI	Body Mass Index
BMU	Borderlands México-USA
CAP	Centre for Aromatic Plants
CBO	Community Based Organisation
CDH	Conservation, Development and Harvesting
CE	Community Engagement
CEE	Centre for Environment Education
CEET	Centre for Environmental Education Training
CGEC	Centre for Global Environmental Culture
CIMAP	Central Institute of Medicinal and Aromatic Plants
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CLTS	Community Led Total Sanitation
CM	Casa del Migrante
COMBI	Communication for Behavioural Impact
COTHN	Centro Operativo e Tecnológico Hortofrutícola Nacional
CPR	Centre for Policy Research
CRC	Cluster Resource Coordinator
CRPD	Convention on the Rights of Persons with Disabilities
CSIR	Council of Scientific and Industrial Research
D1SC	Dengue 1 Stop Centre
DET	Disability Equality Training
DISE	District Information System for Education
DP	Dorothy's Place
EE	Environmental Education
EEA	Environmental Education and Awareness
EFA	Education For All
EFSA	European Food Safety Authority
ER	Emergency Room
ESCO	Escola de Serviços e Comércio do Oeste
ESD	Education for Sustainable Development
ESP	Education Sector Plan
ESTM	Escola Superior de Turismo e Tecnologia do Mar
FAO	Food and Agricultural Organization
FCT-UNL	Faculdade de Ciências e Tecnologia-Universidade Nova de Lisboa
FEPPCAR	Forestry Environment Plantation Crop and Permaculture Consultancy and Research
FGSMP	Flagship Globally Significant Medicinal Plants
FNRI-DOST	Food Nutrition and Research Institute – Department of Science and Technology
FP	Family Planning
FRESH	Focusing Resources on Effective School Health
FRLHT	Foundation for Revitalization of Local Health Traditions
GAP	Global Action Programme
GACP	Good Agriculture and Collection Practices
GCED	Global Citizenship Education
GDAP	Global Disability Action Plan
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Green House Gas
GMO	Genetically Modified Organism
GoI	Government of India
GSMP	Globally Significant Medicinal Plants
GVSU	Grand Valley State University
HAPPRC	High Altitude Plant Physiology Research Centre
HEI	Higher Education Institution
HIV	Human Immunodeficiency Virus
HRDI	Herbal Research Development Institute
HVWSHE	Human Values-based Water, Sanitation and Hygiene Education
HWSN	Health and Well-being Support Network
ICT	Information Communication Technology
IEC	Information Education Communication
IFAD	International Fund for Agricultural Development
IHR	Indian Himalayan Region
iM4U	I Malaysia for Youth
IMAM	Islamic Medical Association of Malaysia
IMHERE	Indonesia- Managing Higher Education for Relevance and Efficiency
IMPCL	Indian Medicines Pharmaceutical Corporation Limited
INE	Instituto Nacional de Estatística
IPC	Interprofessional Collaboration
IPCC	Intergovernmental Panel on Climate Change
IPL	Politécnico de Leiria
IPMA	Instituto Português do Mar e da Atmosfera
IPR	Intellectual Property Rights
IPSCI	International Perspectives on Spinal Cord Injury
ISAAA	International Service for the Acquisition of Agri-biotech Applications
ISDD	Innovative Solutions for Disadvantage and Disability
IUBAT	International University of Business, Agriculture and Technology
JMB	Joint Management Body
JMP	Joint Monitoring Programme
LCA	Life Cycle Assessment
LL/CDT	Living Lab/Centro de Diálogo y Transformación Inc.
LoC	Line of Control
MAPs	Medicinal and Aromatic Plants
MASIA	Malaysia Spinal Injury Association
MDGs	Millennium Development Goals
MDM	Mid-day Meal
MEA	Millennium Ecosystem Assessment
MGNRES	Mahatma Gandhi National Rural Employment Guarantee Scheme
MIMPA	Malaysian Integrated Medical Professionals Associations
MLD	Million Litres per Day
MM	Million
MOH	Ministry of Health
MPCA	Medicinal Plant Conservation Area
MPDA	Medicinal Plant Development Area
MPI	Movimento Pró-Informação para a Cidadania e Ambiente
NBA	Nirmal Bharat Abhiyan
NCD	Non Communicable Diseases
NEWT	Nanotechnology-Enabled Water Treatment
NGO	Nongovernmental Organisation
NP	Nyaya Panchayat
NRDWP	National Rural Drinking Water Programme
NTFP	Non Timber Forest Produce
OCH	Opportunity Centre for the Homeless
OD	Open Defecation
ODF	Open Defecation Free
OVC	Online-Video-Course
PAA	Priority Action Area
PAHO	Pan American Health Organization
PHC	Primary Health Care
PHM	People's Health Movement
PIAT	Pusat Inovasi AgroTeknologi
PSDM	Pre-School Dengue Module
PSG-SCI	Peer-Support Group for Persons with SCI
PTF	Plataforma Transgénicos Fora
PWDs	Programme for Persons with Disabilities
RCE	Regional Centre of Expertise on Education for Sustainable Development
SASS	Safe Ag, Safe Schools
SBM	Swachh Bharat Mission
SCI	Spinal Cord Injury
SCP	Sustainable Consumption and Production
SDM	Shared Decision-making
SDMC	School Development Management Committee
SFS	Sustainable Food Systems
SFSP	Sustainable Food Systems Programme
SMPB	State Medicinal Plant Board
STARs	Sustainability Tracking, Action and Reporting in Schools
SUN	Scaling Up Nutrition
SUST	Shahjalal University of Science and Technology
SDGs	Sustainable Development Goals
SWOT	Strengths, Weaknesses, Opportunities, Threats
TBH	Teddy Bear Hospital
TDU	Transdisciplinary University
TERI	The Energy and Resources Institute
TLE	Technology and Livelihood Education
ToT	Training of Trainers
UGM	Universitas Gadjah Mada
UM	University of Malaya
UMMC	University Malaya Medical Centre
UNCED	UN Conference on Environment and Development
UNCRPD	United Nations Convention on the Rights of Persons with Disabilities
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations Children's Fund
UNPD	United Nations Population Division
UNSCN	United Nations Standing Committee on Nutrition
USMBHC	United States-México Border Health Commission
USTC	University of Science and Technology Chittagong
UTEP	University of Texas at El Paso
VFC	Village Forest Council
VGtS	Vegetables Go to School
WASH	Water, Sanitation and Hygiene
WEHAB	Water, Energy, Health, Agriculture and Biodiversity
WFP	World Food Programme
WHA	World Health Assembly
WHO	World Health Organizaton
WHR	World Health Report
WRD	World Report on Disability
WWF	World Wide Fund
WWOOF	World Wide Opportunities on Organic Farms
10YFP	10 Year Framework of Programmes on Sustainable Consumption and Production Patterns

GLOBAL MAP OF RCES

The ESD Programme at UNU-IAS has created a global network of more than 150 Regional Centres of Expertise on Education for Sustainable Development (RCE) worldwide. The RCEs provide a framework for strategic thinking and action on sustainability by creating diverse partnerships among educators, researchers, policymakers, scientists, youth, leaders within indigenous communities and throughout the public, private and non-governmental sectors.

Because of each RCE's diverse network of partners and their wealth of local knowledge and resources, they have the potential to transform the way we approach health, sanitation, nutrition, and hygiene issues. As these topics are critically linked across different sectors, RCEs are best equipped to tackle these issues. Globally, RCEs have launched a number of ground-breaking ESD initiatives that address some of the greatest health-related challenges we face today.

AFRICA & MIDDLE EAST
Buea, Cameroon
Cairo, Egypt
Ghana
Jordan
Central Kenya, Kenya
Greater Nairobi, Kenya
Greater Pwani, Kenya
Kakamega-Western Kenya, Kenya
Mau Ecosystem Complex, Kenya
Mount Kenya, Kenya
North Rift, Kenya
Nyanza, Kenya
South Rift, Kenya
Lesotho
Zomba, Malawi
Maputo, Mozambique
Khomas-Erongo, Namibia
Kano, Nigeria
Lagos, Nigeria
Minna, Nigeria
Port Harcourt, Nigeria
Zaria, Nigeria
Senegal
Gauteng, South Africa
KwaZulu Natal, South Africa
Makana and Rural Eastern Cape, South Africa
Swaziland
Dar es Salaam, Tanzania
Greater Eastern Uganda, Uganda
Greater Kampala, Uganda
Greater Masaka, Uganda
Greater Mbarara, Uganda
Lusaka, Zambia
Harare, Zimbabwe
Mutare, Zimbabwe

THE AMERICAS
Chaco, Argentina
Cuenca del Plata, Argentina
Curitiba-Parana, Brazil
Rio de Janeiro, Brazil
Sao Paulo, Brazil
British Columbia, Canada
Greater Sudbury, Canada
Mauricie/Centre-du-Quebec, Canada
Montreal, Canada
Peterborough-Kawartha-Haliburton, Canada
Saskatchewan, Canada
Tantramar, Canada
Toronto, Canada
Bogota, Colombia
Guatemala
Borderlands México-USA, México
Western Jalisco, México
Lima-Callao, Peru
Georgetown, USA
Grand Rapids, USA
Greater Burlington, USA
Greater Portland, USA
Shenandoah Valley, USA

ASIA-PACIFIC
Gippsland, Australia
Greater Western Sydney, Australia
Murray-Darling, Australia
Tasmania, Australia
Western Australia, Australia
Greater Dhaka, Bangladesh
Greater Phnom Penh, Cambodia
Anji, China
Beijing, China
Greater Shangri-la, China
Hohhot, China
Kunming, China
Tianjin, China
Bangalore, India
Chandigarh, India
Chennai, India
Delhi, India
East Arunachal Pradesh, India
Goa, India
Guwahati, India
Jammu, India
Kodagu, India
Kozhikode, India
Lucknow, India
Mumbai, India
Pune, India
Srinagar, India
Thiruvananthapuram, India
Tirupati, India
Bogor, Indonesia
East Kalimantan, Indonesia
Yogyakarta, Indonesia
Kitakyushu, Japan
Yokohama, Japan
Chubu, Japan
Greater Sendai, Japan
Hokkaido Central, Japan
Hyogo-Kobe, Japan
Okayama, Japan
Kyrgyzstan
Central Semenanjung, Malaysia
Iskandar, Malaysia
Penang, Malaysia
Waikato, New Zealand
Bohol, Philippines
Cebu, Philippines
Ilocos, Philippines
Northern Mindanao, Philippines
Pacific Island Countries, Regional
Changwon, Republic of Korea
Incheon, Republic of Korea
Inje, Republic of Korea
Tongyeong, Republic of Korea
Ulju, Republic of Korea
Cha-am, Thailand
Maha Sarakham, Thailand
Trang, Thailand
Southern Vietnam

EUROPE
Middle Albania, Albania
Graz-Styria, Austria
Vienna, Austria
Belarus, Belarus
Czechia, Czech Republic
Denmark
Espoo, Finland
Bordeaux Aquitaine, France
Brittany, France
Paris Seine, France
Black Forest, Germany
Hamburg, Germany
Munich, Germany
Nuremberg, Germany
Oldenburger Münsterland, Germany
Ruhr, Germany
Stettiner Haff, Germany
Central Macedonia, Greece
Crete, Greece
Dublin, Ireland
Euroregion Tyrol, Italy
Vilnius, Lithuania
Açores, Portugal
CREIAS-Oeste, Portugal
Porto Metropolitan Area, Portugal
Rhine-Meuse Region, Regional
Nizhny Novgorod, Russia
Samara, Russia
Vojvodina, Serbia
Barcelona, Spain
North Sweden, Sweden
Skane, Sweden
Uppsala-Gotland, Sweden
West Sweden, Sweden
East Midlands, UK
Greater Manchester, UK
London, UK
North East, UK
Scotland, UK
Severn, UK
Wales, UK
Yorkshire & Humberside, UK

List of RCEs as of November 2017

ENSURE HEALTHY LIVES AND PROMOTE WELL-BEING FOR ALL – LEARNING FOR SUSTAINABILITY

Unnikrishnan Payyappallimana, Zinaida Fadeeva.

1. Health and Well-being as part of the 2030 Agenda, Intersectoral Linkages and Challenges

The Millennium Development Goals (MDGs) brought in fresh, targeted perspectives in addressing sustainable development globally. Substantial progress has been made in the key target areas of the MDGs in terms of reducing poverty, improving education and improving access to safe drinking water. Progress has also been made in terms of controlling HIV, Tuberculosis and Malaria epidemics as well as in reducing child and maternal mortality (*WHO, 2015a*) .

While there has been considerable progress, the MDG approach has had its challenges such as "limited focus, resulting in verticalization of health and disease programmes in countries, a lack of attention to strengthening health systems, the emphasis on a 'one-size-fits-all' development planning approach, and a focus on aggregate targets rather than equity" (*WHO, 2015a*). This has prompted the move to a more comprehensive, integrated approach through the Sustainable Development Goals (SDGs), thereby focusing more broadly on people, planet, prosperity, peace and partnerships (*WHO, 2012a*). The scope of health-related goals has also become wider and more ambitious, as explicitly

mentioned in the framing "Ensure healthy lives and promote well-being for all at all ages". In the 2030 Agenda, goals 1 to 6 (poverty, hunger and food security, health, education, gender equality, and water and sanitation) directly address health and its immediate drivers and determinants. At the same time, nearly every goal is closely linked with health (figure below). 'Leaving no one behind' is the global ambition of the SDGs, based on the perspective that progress in different sectors is mutually dependent, requiring a more integrated approach.

As we progress into the second year of implementation of the SDGs, much is desired in terms of the basic needs of health, hygiene, sanitation, and nutrition especially in low and middle-income countries. According to the SDG baseline data on child health, more than 5.9 million children died in 2015 before the age of five (*UNDESA, 2017*), nearly 80% of child mortality occurs in sub-Saharan Africa and Southern Asia, owing to challenges such as poverty and lack of basic education (*UNICEF, 2016*). In maternal health, while recognising improvements in terms of reproductive care, there exists major disparity among regions – maternal mortality continues to be 14 times higher in low and middle-income regions as compared to economically developed countries. There is also the continuing challenges of HIV/AIDS, Malaria and neglected diseases and newly emerging infections. The health sector is also faced with the added burden of lifestyle diseases, accidents and injuries, microbial resistance, a rise in behavioural risk factors such as smoking, alcohol consumption, and sedentary lifestyle, new pandemics and emerging infections, and other morbidities related to climate change (*Jamison et al., 2013*).

In the area of nutrition, agriculture continues to be providing livelihoods for 40% of the global population and is a major source of jobs and income for poor households. Yet paradoxically approximately 12.9% of the population in developing countries is undernourished. Poor nutrition causes nearly 50% of under-five mortality or leads to stunting in a major section of the population. It is estimated that 75% of the crop diversity has been lost in the last two decades in farms. Localising agricultural development through small holder farming, improving access to resources for women, increasing energy access and enhancing crop diversity are considered important ways forward for food security, improving nutrition, livelihoods and resilient farming systems among the poor[1].

On water and sanitation, around 12% of the world population does not have access to safe drinking water, and water scarcity affects 40% of the global population. A study by WHO and UNICEF shows at least 1.8 billion people globally use a source of drinking water with faecal contamination (*Eid, 2015*). Mortality, due to preventable water and sanitation-related diarrhoeal diseases is 1,000 children per day. According to Bartram and Cairncross (*2010*), this major disease burden occurs through lack of hygiene, sanitation and water access leading to diarrhoeal deaths (53%), malnutrition-related consequences (29%) and protein energy malnutrition (7%). All these are preventable through awareness and access to simple, cost effective interventions. Apart from these, simple sanitation and hygiene measures can prevent key public health problems like intestinal helminthiases, giardiasis, schistosomiasis, trachoma, and numerous other globally critical infections (*Bartram and Cairncross, 2010*).

Health-related challenges are not just of health indices or infirmities, but clearly include health system governance and service delivery at the community level. Ideally health services should deliver quality assured, safe, effective, appropriate and equitable health interventions, and timely and reliable information for the communities. Such a system should have an adequate workforce that is responsive, competent and efficient with an appropriate distribution system in place to deliver quality services and create awareness. A health system must be supported by adequate resources, be used efficiently, have appropriate financial protection and should be led and governed by strategic policy and regulatory frameworks with a participatory, systemic approach and accountability (*WHO, 2007*). However, inadequate institutional arrangements, lack of universal access, irrational use of drugs, increasing expenditure on account of health and burden of out of pocket spending among others remain major concerns (*WHO, 2010*).

Health in the SDG Era (WHO, 2016a).

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[1] Goal 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture *http://www.un.org/sustainabledevelopment/hunger/*

2. Intersectoral, Participatory Health Action – Historical Trajectory and Developments

The WHO Constitution in 1946 envisioned a comprehensive view of health (which is well reflected in a frequently quoted definition) – "Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity". It was in Alma Ata (*1978*), that the need for urgent action in primary healthcare through a participatory approach to achieve 'Health for All' was called for. It stressed the need for not just curative and institutionally delivered healthcare, but preventive, promotive and rehabilitative services, and comprehensive and coordinated efforts across sectors and communities. The declaration said "(health) involves, in addition to the health sector, all related sectors and aspects of national and community development, in particular agriculture, animal husbandry, food, industry, education, housing, public works, communications and other sectors; and demands the coordinated efforts of all those sectors". More importantly, "education concerning prevailing health problems and the methods of preventing and controlling them; promotion of food supply and proper nutrition; an adequate supply of safe water and basic sanitation; maternal and child healthcare, including family planning; immunisation against the major infectious diseases; prevention and control of locally endemic diseases; appropriate treatment of common diseases and injuries; and provision of essential drugs" were also highlighted as key strategies. Yet another unique feature of the Alma Ata declaration is the inclusion of self-reliance both at the individual and at the community level; participatory engagement in all aspects including planning, organisation of primary healthcare; utilisation of maximum local and national available resources; and effective capacity building of communities to participate in planning and implementation.

Keeping the Alma Ata spirit alive, the Ottawa Charter (*1986*) at the first international conference on health promotion organised in Canada, highlighted fundamental prerequisites and resources for ensuring health viz. peace, income, shelter, stable ecosystem, education, resource sustainability, food and nutrition, social justice and equity. The Ottawa Charter also focused on critical factors such as the need for self-help, social support, public participation for achieving good health and the vital need for information sharing and capacity building through life

long health education, facilitated through formal and non-formal means (*Ottawa Health Charter on Health Promotion, 1986*).

The World Health Report (*WHO, 1999*) – 'Making a Difference', released by the then WHO Director General Gro Harlem Brundtland, highlighted that income and education were the key determinants behind health improvements in low and middle-income countries between 1960 and 1990. The Report also highlighted the importance of poor nutrition, sanitation and other connected factors to poor health, yet it called for focusing on the health sector than other sectors.

The World Health Report 2008 'Primary Health Care – Now More than Ever', reiterated the need for a focus on primary healthcare and community participation. "At the core of policy dialogue is the participation of the key stakeholders. As countries modernise, their citizens attribute more value to social accountability and participation. Throughout the world, increasing prosperity, intellectual skills and social connectivity are associated with people's rising aspiration to have more say in what happens at their workplaces and in their communities – hence the importance of people-centredness and community participation – and in important government decisions that affect their lives – hence the importance of involving civil society in the social debate on health policies" (*WHO, 2008b*).

Around the same time the Pan American Health Organisation publicised 'Renewing Primary Health Care in the Americas: A Position Paper of the Pan American Health Organization/World Health Organization' (*PAHO/WHO, 2007*) which emphasised equity, solidarity, responsiveness to people's health needs, quality orientation, government accountability, social justice, sustainability, participation and appropriate governance and intersectorality for achieving the highest attainable level of health. It also underlined the need for disease prevention and promotion of health and active mechanisms to maximise individual and collective participation in health. By referring to the People's Health Movement Charter (*2000*)[2] (which is the most widely endorsed people's and civil society's commitment to primary healthcare following Alma Ata), PAHO reaffirmed the human rights aspect of health not just in principle but action (*PHM, 2000*).

Understanding the implications of health across policies and integrating health in all policies at multi-levels of governance have been suggested as important strategies

for effective outcomes as affirmed at the 8th Global Conference on Health Promotion held in Helsinki in 2013 (*WHO, 2014*). At the local level, engagement of state and non-state actors and multi-stakeholder partnerships have become an important mechanism for identifying challenges, interests and synergies as well as advocating relevant policy changes and effective implementation.

As evident in the two milestone multi-lateral proclamations (Alma Ata on PHC and Ottawa Charter on health promotion), environmental, socio-economic determinants of health and their interlinkages, as well as community participation and empowerment, have remained key priorities of the sustainable development deliberations from the early years. At the Earth Summit (UN Conference on Environment and Development) held in Rio de Janeiro, in 1992, Agenda 21, the social and economic dimensions section was directed towards combating poverty, addressing consumption patterns, promoting health, and achieving a more sustainable population.

The UN Millennium Summit in 2000 lead to the Millennium Development Goals (MDGs), with a fifteen-year action agenda, and a targeted action plan. All MDGs were critically linked to health either directly (eradicating poverty and hunger, reducing child mortality, combating HIV/AIDS, Malaria and other diseases, improving maternal health) or as indirect drivers (achieving universal primary education, promoting gender equality and empowerment of women, ensuring environmental sustainability and global partnership for development). In a parallel development, in 2002, the World Summit on Sustainable Development (also known as the Earth Summit) set up several comprehensive frameworks and programmes towards sustainable development, including the Decade on Education for Sustainable Development (DESD). It was in Johannesburg, where an inclusive framework for addressing certain basic needs such as food, water, shelter, sanitation, energy, health services and economic security were discussed. This called for a distinct multi-stakeholder process, involving state and non-state actors, and resulted in a framework called WEHAB (Water, Energy, Health, Agriculture (food, nutrition) and Biodiversity and Ecosystems. Health, sanitation, and nutrition continued to be high on the agenda.

Whereas the impact of socio-economic conditions of societies and related policies on health and well-being is well established, this has also evolved and broadened over the years into more systemic, transdisciplinary and strategic approaches. The Commission on Social Determinants of Health by WHO in 2008 was yet another milestone in broadening these perspectives on health. It conducted a detailed assessment and came out with targeted action areas such as improving daily living conditions, tackling the inequitable distribution of power,

money and resources, and putting in a mechanism for monitoring and impact assessment (*WHO, 2008a*). There was also an increased understanding of the societal factors and principles such as structural determinants, freedom, capabilities, plurality, equity, access, rights, social security, and related policy and regulatory frameworks and their impact on health and well-being.

In recent years there has been a growing realisation that human health is also inherently linked to more complex scenarios of environment and development such as ecosystem changes (*Millennium Ecosystem Assessment, 2005*), unequitable and unsustainable production and consumption practices, and climate change among others (*WHO, 2012b*). Several novel intersectoral perspectives are emerging today on environmental determinants and health. This is driven by emerging new infectious diseases, rapid increases of non-communicable diseases, rising morbidity due to ecosystem and climatic changes, increased awareness of challenges of chemical use in human and livestock farming like antibiotics, fertilisers, and pesticides in agro-ecological systems and so on (*WHO, 2012b*). One health, eco-social health, planetary health, global health, conservation health, biodiversity and health, and health pluralism are some of the terms that encourage links with these broader frameworks. The Lancet Commission on planetary health (*Whitme et al., 2015*) well highlights the integrated nature of human and planetary health. The impact of climate change on health with its loss of biodiversity and subsequent ecosystem changes, plus the impacts of disasters, malnutrition, and the challenges of unsustainable production and consumption on health have all been highlighted. Other new paradigms have also broadened the mandate of health today, including human happiness, well-being, ecosystem transition, preparedness, prevention, alternative development indices, planetary boundaries, risk society, commons, and coevolution, to name but a few key words that help describe these perspectives. Though the 13 SDG health-related targets do not reflect this breadth or complexity (*WHO, 2015a*), the framing of Goal 3 as 'To Ensure healthy lives and to promote well-being for all at all ages' embodies this comprehensiveness and ambition.

A number of targeted multi-lateral participatory initiatives have also been implemented on water, sanitation, hygiene and nutrition, led by WHO and other multi-lateral agencies. Joint Monitoring Programme on Water and Sanitation of UNICEF and WHO has been active on monitoring water and sanitation targets of the MDGs. It also specifically has been collecting data on open defecation in different regions since the UN International Year of Sanitation in 2008. This gave impetus for WASH (Water, Sanitation and Hygiene) in a major way and in 2015, WHO announced a global plan to integrate WASH in its efforts to tackle 17 neglected tropical diseases (*WHO, 2015b*). Other agencies

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[2] The People's Charter for Health is a statement of the shared vision, goals, principles and calls for action that unite all the members of the PHM coalition. It is the most widely endorsed consensus document on health since the Alma Ata Declaration available in 40 languages. The People's Health Charter was formulated and endorsed by the participants of the First People's Health Assembly held at Dhaka, Bangladesh in December 2000. By building on 'people whose voices have rarely been heard before' and asserting that inequality, poverty, exploitation, violence and injustice as root causes of ill health of the poor, PHM encourages people to explore self-reliant solutions for health, while also holding institutional governance structures both local and national accountable for good service delivery. *http://www.phmovement.org/en/resources/charters/peopleshealth*

like UNESCO along with UNICEF, WHO and the World Bank have been focusing on FRESH (Focusing Resources on Effective School Health), initiated during the World Education Forum in Dakar (*2000*) which culminated in the Dakar Framework for Action for Education for All (EFA) and was further endorsed by World Education Forum in 2015 (*Sarr et al., 2017*). As a joint programme of UNESCO, UNICEF, World Bank and the WHO, by focusing on school health and nutrition through simple education sector plan (ESP) intervention, this has been a cost-effective approach to community health as well as education sector goals. UNESCO, through the Global Education First Initiative, focuses on health as one of the critical outcomes of quality education and affirms the strategy "all children and young people have access to safe, inclusive, health-promoting learning environments" and quality education "develops the skills, values and attitudes that enable citizens to lead healthy and fulfilled lives, make informed decisions, and respond to local and global challenges" (*UNESCO, 2016*). Other agencies like UN-HABITAT have been promoting unique programmes like the Human Value based Water Sanitation Hygiene Education (HVWSHE) across Africa and Asia (*UN-HABITAT, 2006*).

Nutrition has also been well recognised as a multi-sectoral development issue. Scaling up nutrition was launched in 2010 to strengthen such multi-sectoral action towards achieving nutrition goals. This was also further strengthened through an interagency programme, supported by FAO[3], IFAD[4], UNICEF, WFP[5] and WHO in 2013 as the UN System Network for Scaling Up Nutrition (SUN). It is well recognised that key drivers like health system strengthening, functioning education systems, social protection, eradication of poverty and reducing inequality, through a human rights based approach are basic premises for nutritional improvement under the UN Global Nutrition Agenda.

The UN Standing Committee on Nutrition is a platform of UN agencies to develop global strategies and initiatives on nutrition. The UN Decade of Action on Nutrition spans 2016-2025. WHO along with UNICEF and USAID has also focused on studying evidence of improved nutrition achieved by improving WASH and how both programmes can be integrated in the implementation (*WHO, 2015c*). Recently, the 10-year Framework of Programmes on Sustainable Consumption and Production Patterns was launched for Sustainable Food Systems (SFS), as a multi-stakeholder initiative, working on diverse aspects such as food value chains, sustainable diets, food waste, raising of awareness, capacity development, and networking[6].

3. SDGs Implementation – Strengthening Bottom up Multi-stakeholder Engagement for Health Promotion through Education

"…knowledge and understanding remain powerful tools in health promotion. Improving health literacy in populations provides the foundation on which citizens are enabled to play an active role in improving their own health, engage successfully with community action for health, and push governments to meet their responsibilities in addressing health and health equity" (*WHO and UNDP, 2016*).

This passage, pointing at the individual and collective responsibility for developing sustainable health systems, allows us to call upon developing perspectives on health and health education vis-à-vis individual and collective and, consequently, to position health education in the realm of other significant factors impacting on healthy lifestyles. The Ottawa Charter on health promotion in 1986 amply highlighted such inter-sectoral multi-stakeholder participatory action, especially through educational interventions, which were further endorsed by the succeeding Jakarta (*1997*), Bangkok (*2005*), Helsinki (*2013*) health promotion declarations and even as recently as the Shanghai Declaration (*2016*).

This approach to proactive action also resonated in the UN Decade on Education for Sustainable Development. The post decade sustainable development agenda on education, Global Action Programme (GAP) continues to highlight local action as a critical area – accelerating sustainable solutions at the local level. GAP 5 reasserts the need for improving local partnerships and creating dialogue and learning spaces through upscaling and improving quality through formal, non-formal and informal education[7]. GAP calls for integration of Education for Sustainable Development (ESD) programmes and ESD perspectives into policies and planning across sectors (Box 1). This should include public authorities, academic institutions, schools, private enterprises, civil society organisations, community based organisations, and other informal education institutions in health.

Box 1 – The Global Action Programme (GAP) on education for sustainable development (ESD) aims at two critical aspects in the attempt to contribute to "a world where everybody has the opportunity to benefit from education and learn the values, behaviour and lifestyles required for a sustainable future and for positive societal transformation". The two ambitions of GAP – transforming educational systems through incorporating sustainability into educational processes and systems and to put education as a key strategy to make development processes more sustainable – provide further argument for engagement between the learning institutions and other stakeholders for development. Such engagement is at the core of the regional centres of expertise on ESD (RCEs). Priority Action Area 5 of GAP recognised the critical importance of engagement at the local level for accelerating sustainability solutions.

System thinking, anticipatory ability, normative, strategic, collaborative, critical thinking, integrated problem-solving competencies and self-awareness are some of the key competencies in sustainability learning. UNESCO, in its recent publication (*2016*) on Education for Sustainable Development Goals mentions key cross cutting competencies for sustainability and learning outcomes relevant to all SDGs. Specific goal-related learning, cognitive, socio-emotional and behavioural learning objectives for the learners and learning approaches and methods are indicated. While these may sound quite academic, it is important to integrate such capacity building approaches in multi-stakeholder initiatives.

As the SDGs reaffirm the need for a broadened focus, a diversity of intersectoral development approaches and integrated action in health, it also calls for strong participatory supportive action through multi-stakeholder partnerships at subnational, and local levels for health system strengthening. The advantages of such an approach through social learning and participatory action is clearly on the one hand to conduct evaluation of institutional services, but at the same time complementing them with appropriate contextually relevant intersectoral community engagement towards disease prevention and health promotion. This could be through health sector actions or through ecosystem approaches in nutrition and food security; through clean air and fresh water; or social and cultural support and rehabilitation systems; as well as improving local livelihoods. Whatever perspective is chosen, a learning element, through posing appropriate questions, critical review of the practices, documenting learning and innovations, and paying attention to the underlying assumption and values would have to be brought into participatory processes.

3.1 Health and Education – Reinforcing Issues

"Health literacy empowers individual citizens and enables their engagement in collective health promotion action. A high health literacy of decision-makers and investors supports their commitment to health impact, co-benefits and effective action on the determinants of health. Health literacy is founded on inclusive and equitable access to quality education and life-long learning. It must be an integral part of the skills, and competencies developed over a lifetime, first and foremost through the school curriculum."
Shanghai Declaration on Health Promotion, 2016.

The links between education and learning are well-recognised and positively acknowledged by a large body of knowledge. To appreciate the importance as well as complexity of this relationship, let us consider the issues of literacy, education and health education.

Levels of literacy are often correlated with other components constituting human well-being as they affect a person's ability to be employed and connected to effective engagement in community life. The most convincing data come from the area of women's education where the literacy rate, measured by years spent at school, is linked, together with other top ten indicators, to the well-being of women. The education of women positively correlates with a reduction in child mortality and fertility rate, while, at the same time, contributing to the capacity to learn (*Feinstein et al., 2016*). While the 'case' for literacy is celebrated, literacy within education is often narrowly understood and might not be enough to realise the dream of a healthy population. This brings us to the discussion of health education.

The examples of some countries with high rates of education show that general education (or education alone) did not prevent the spread of communicable diseases. While health education might contribute to addressing this challenge, other factors such as power relations, gender, and social structures play decisive roles. For example, in Zimbabwe and South Africa, despite having the highest rates of literacy among African countries, their HIV infection rates remain among the highest in the world, especially among women (*Kickbusch, 2001*). In addition, the high rate of infection and mortality have been persisting among school teachers, once again highlighting the deviation from the degree of education-health correlation, but also criticality of other social and economic factors as well.

This assumingly has prompted UNESCO to create two new strategic priorities "ensuring that all children and young people benefit from good quality, comprehensive sexuality education that includes HIV education, and

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[3] FAO – Food and Agricultural Organization of the United Nations
[4] IFAD – International Fund for Agricultural Development
[5] WFP – World Food Programme
[6] Sustainable Food Systems Programme *http://www.unep.org/10yfp/programmes/sustainable-food-systems-programme*
[7] Accelerating Sustainable Solutions at the Local Level *http://en.unesco.org/gap/priority-action-areas/local-level*

ensuring that all children and young people have access to safe, inclusive, health-promoting learning environments" (*UNESCO, 2016*).

Taken from a broader perspective, education provides opportunities to find a better job, to choose a better living environment, to practice a healthier lifestyle, to gain access to better health coverage and services, and potentially to better be able to adapt to changing circumstances. In short, it can provide all the conditions that help secure the health of individuals and communities. The state of health, including the existence of disabilities, impacts on the ability to achieve the desired level of education by affecting learners' concentration and attendance. Social factors, including family situations, community practices and traditions, and social and economic policies all mediate the complex relations between health and education.

3.2 What Type of Education Are We Looking For?

Health professionals, development specialists, educational practitioners and many others who deal with the challenge of advancing human well-being and ecological health, all agree that a simplistic or narrow understanding of literacy and education that is limited to reading, writing, and calculation does not serve individuals or society. In the context of the SDGs, health literacy is seen beyond the ability to organise a health appointment or to follow health advice. It puts an emphasis on a person's ability to act on information for the benefit of themselves, their families and their communities. The reference to Education for Sustainable Development (ESD) that specifies competences (Box 2) requires a change in the way of thinking on education towards transformation.

> **Box 2 – Competences for sustainable development**
> (*Wiek et al., 2011*)
>
> • **Systems-thinking competence** – ability to analyse different domains and scales of complex systems to define relevant issues and develop problem-solving frameworks
> • **Anticipatory competence** – ability to analyse and evaluate the complex picture of the future in relation to sustainability issues
> • **Normative competence** – ability to define and reconcile sustainability values and goals
> • **Strategic competence** – ability to design and implement actions toward sustainability
> • **Interpersonal competence** – ability to engage with sustainability actions; to collaborate as 'a prerequisite for all other competencies'.

3.3 Strengthening Alternative Worldviews on Health and Well-being

In the recent discussions on sustainability, there has been fresh thinking on alternative worldviews and perspectives provided by diverse knowledge systems on health and well-being. The idea of holistic health traditions has existed for a long time, but recently there have been some new frames of reference that allow mainstreaming of more holistic approaches. 'To be established in one's self or own natural state' is optimal health according to some health cultures (*Payyappallimana, 2013*). To achieve this, one must have a balance of physical, mental, spiritual, social and ecological dimensions of existence. This balance is achieved through optimal equilibrium between a 'being' and their external surroundings. Based on this philosophy, there are distinct epistemological principles and practices for prevention and promotion of healthcare in local health cultures.

Similarly, the biopsychosocial model of health, a framework developed by Engel (*1977*), brings the whole concept of health from a purely biological realm into, as the name suggests, the psychological and social factors of health. The concept has gained popularity with health professionals, making them consider the broader factors impacting on the health and well-being of individuals and communities, indicating that healthcare alone does not provide health. Similarly the concept of 'salutogenesis' coined by Aaron Antonovsky (*1979*), depicts an approach that focusses on the drivers of health and well-being rather than focusing on morbidities or pathogenesis. Booske *et al.*, (*2010*) based on a Country Health Ranking study highlights that medical care alone is responsible for less than 20% of determinants of health, while socio-economic, environmental, and public health factors had a much bigger role in achieving good health. While the contribution of different factors will vary from region to region, the need for attention to the social, economic, political, and environmental factors is undisputed. These clearly point to the possibility that such alternative models and frameworks can complement the current public health approach (*Becker et al., 2010*) and the need for the development of fresh theories on health and well-being. The two questions remain, what are the possible strategies for addressing how these factors are linked and what is the new role of education and learning in achieving this goal?

4. Regional Centres of Expertise Network on Education for Sustainable Development

This publication shares the experiences of the multi-stakeholder networking and learning approach of the Regional Centres of Expertise Network (RCEs), a unique and innovative platform created during the UN Decade on Education for Sustainable Development (UNDESD) to explore the challenge of local solutions for local sustainability challenges. After twelve years of existence, RCEs have grown to 158 local and regional networks across different continents. Each of the RCEs represents diverse stakeholders, including educators, policy makers, researchers, communicators, youth, community leaders, representing public, private and nongovernmental organisations (*Fadeeva et al., 2014*).

The idea of RCEs came about to tackle education for sustainable development at all levels but with a strong local focus. The basic tenet of the RCE is the creation of a local knowledge base and governance structure for collective action, applied to locally relevant and culturally appropriate development. Most RCEs are hosted or actively facilitated by a higher education institution, where scientifically sound sustainability ideas and transformative education are being promoted. The multi-stakeholder network has an inclusive approach in terms of bringing in the maximum number of 'actors' as possible, and covers different forms and levels of education, including lifelong learning. Diverse thematic areas have evolved within the networks over the years, with health and well-being a strong area of engagement and interest.

This publication is a collection of diverse experiences and reflections of the Regional Centres of Expertise across the world. The multi-stakeholder action in the RCE networks is not a uniform or standardised approach. Diversity in local networking, multiple views and methodologies are nurtured within the network, thus there may not be uniformity or shared standards across local experiences or in their descriptions. Broadly the case studies have been grouped under three areas – Community Health, Water, Sanitation, and Hygiene (WASH), and Nutrition. Though they have been grouped in this way, most case studies portray cross-sectoral linkages and actions.

4.1. Community Health

In this section, six interventions of community health have been covered, specifically health promotion programmes, or improvement or advocacy for existing institutional health services.

RCE Grand Rapids – By bringing together areas of healthy lifestyle and medicine, preventive strategies towards health have been successfully practised by *RCE Grand Rapids*. The Health and Wellness Programme of the RCE aims at proactive neighbourhood health, wellness, and nutrition so that all residents' well-being is increased and use of medical emergency services is minimised. Such a strategy is based on engagement across sectors with a goal to empower communities to take care of their health, to be able to understand and interpret holistic and specific health-related information, while providing the decision makers with reliable data for devising strategies to continuously improve people's health and healthcare. Importantly, the range of health providing facilities has increased from emergency rooms to primary holistic healthcare centres, including referrals of patients to Mercy Health, dental clinics, immunisations, and preventive healthcare screening services, bringing a more coherent approach to wellness and healthcare. Cross sectoral planning is well articulated in this case study.

RCE Central Semenanjung – The community health project on spinal cord injury (SCI) demonstrated a way of establishing a system that facilitates patient empowerment, self-care, and patient engagement in treatment decision-making. To achieve the objective, an adequate understanding of the challenges and skills for care and self-care of the patients, and the communities was needed. In the field of health literacy, the ability to access and to interpret information is critical, yet not well established. Moreover, a paternalistic attitude towards rehabilitation by the doctors is still common. A three-pronged approach was offered to facilitate quality of life for the SCI patients: 1) provision of a multidisciplinary health education programme or SCI information package leading to a better understanding of health information and its use; 2) peer mentoring leading to quicker integration into the community, guided by those who have experience of this path; and 3) shared decision making about treatment options. While carrying the processes through the meetings, critical learning of the challenges of the processes occurred. It appeared that the scope of mentoring ranged from setting boundaries in giving medical advice, to sharing sensitive information, and finally to the financial practicalities supporting the process. The project has demonstrated the critical need to build learning communities for rehabilitation and healthcare that will contribute to the social health of the society.

RCE Borderlands México-USA – RCE BMU is working among marginalised communities in the border areas between México and the United States. Highlighting the state of healthcare on the US side of the border, the article stresses the need for preventive healthcare and health promotion among vulnerable populations in the region. Healthcare is not recognised as a basic human right under the US legislation, and there is no universal health coverage. There is also a strong inclination towards private insurance among the population. Due to this, though there is state-of-the-art technology and medicines, access to services remains a challenge, especially for marginalised communities. Nearly 23% of the population in the border region lack medical insurance. These populations mostly approach the emergency room services which are 'reactive' and saturated because of high demand. The article highlights class based disparities in the region and shares the experiences of creating a health and well-being support network through multi-stakeholder networking.

RCE Greater Dhaka – Slum dwellers in Dhaka suffer from a variety of problems, ranging from poor infrastructure to bad nutrition, over-exhaustion, and disease. With an understanding of the multifaceted nature of the problem, the RCE has developed a programme that addresses nutrition, hygiene and health needs, while providing management and funding services to address the challenge. This happens through the contribution of the specialist institutions as well as through agencies, capable of coordinating their actions with a variety of interventions including health camps, regular check-ups, trainings, immunisation and blood donation programmes. Recognising the importance of nutrition, and awareness of healthy lifestyles has become a subject of awareness and training campaigns. The focus of the health and nutrition intervention has been selected based on research, supported by international partners. The programmes are accompanied by intervention of students and researchers from local and international universities, mainly in the area of capacity development and research. This is an interesting example of engagement between a higher education institution and local communities to link the local and global agenda.

RCE Yogyakarta – With a focus on the traditional medical system and community health, Universitas Gadjah Mada (UGM), National Centre for Research and Development of Medicinal Plant and Traditional Medicine and representatives of the pharmaceutical industry have engaged with the community. The aim of this collaboration is to develop a community based enterprise that encourages actions across the value chain of medicinal products right from cultivation to the consumer.

The programme, co-designed with the community, led to better knowledge of medicinal plants and materials, to an ability to cultivate and use herbal medicine by the community members and, as a result, showed improved healthcare while bringing greater economic opportunities for the community, for farmers, and for small and medium enterprises, working with traditional herbal materials. The case study highlights how academic programmes can be transformed to address social challenges through participatory action research.

RCE Srinagar – The medicinal plant programme aimed to establish communication to support community participatory processes leading to mainstreaming actions towards conservation and the sustainable use of medicinal plants, and eventually to the improvement of health, of livelihood opportunities and of quality of life in general. This is critical as improvement of the required measures is not possible without active engagement of local communities. The approach of conservation and sustainable use was challenging because of a lack of understanding about heritage and livelihood options (e.g. interrupted intergenerational exchange, prevalence of other healing approaches and other sources of plants have been contributing factors). The project has relied on a methodology of establishing a communication process through the identification of stakeholders, through messages, and through delivery mechanisms. The development of the instruments and strategies has been participatory, thereby assuring sustenance of the programme and commitment of core stakeholders.

4.2. Water, Sanitation and Hygiene

In this section, five interventions are covered – they pertain to a community based action for controlling a dengue epidemic, school based WASH programmes, a project on the efforts to address open defecation, and another one on Human Value based Water Sanitation Hygiene and Education.

RCE Central Semenanjung – The community based action model #MsiaEndsDengue is a stakeholder network programme designed to contain the dengue epidemic in the Semenanjung region. Dengue has been on the rise in Malaysia since 2014 and has resulted in a threefold rise in mortality. This rise is expected to continue for several decades if appropriate preventive steps are not taken. The partnership between the University of Malaya, civil society organisations including medical professional organisations, and youth have started an innovative programme to support the efforts of the Ministry of Health by holistically integrating medicine, with entomology, through building architecture, and with information

technology and social sciences knowledge through evidence based action. Through the Dengue 1 Stop Centre volunteers from the region offered awareness and training programmes, which empowers communities for collective action and supports participatory surveillance for assuring better sanitation. The project depicts an interesting approach toward community empowerment, and collective, targeted, informed action for containing dengue.

RCE Goa – The article makes a powerful point about the need for addressing different sustainability challenges and the role of schools in changing practices in society. The project created a process in which problems are identified, training and actions are developed and implemented, and monitoring are put in place. The article shows how, through stakeholder engagement, improvement of the actions of students and their families, and more sustainable school operations and sustainability work in the community can be achieved. It demonstrates how collective learning has brought not only changes in sanitation practices at school, but also how these practices have impacted aspects of water and energy efficiency, and waste minimisation that potentially leads to more coherent sustainability-directed behaviour. The project also highlights how private sector enterprises can partake through socially responsible engagements in communities.

RCE Srinagar – The project aims to address the problem of Open Defecation that has important consequences for the health and security of poor and vulnerable people. The problem of open defecation is seen from the perspective of available infrastructure as well as water and its quality. Educational interventions are critical, not only for providing basic infrastructure for the children, and especially girls to stay in schools, but in addition, the pupils were seen as promoters of good sanitation practices. As available funds for the construction of home and institutional toilets are spent on other needs or otherwise misappropriated, this presented additional challenges. Also, when constructed, the facilities are usually not or badly maintained. The Open Defecation Free Programme (ODF) included multi-level activities to create demand for establishing and maintaining sanitation facilities. A governance system for supporting the programme through community coordination and through developing a culture of hygiene and safety was also created. Students and teachers in schools were critical agents for achieving the goals. The project highlighted the importance of opinion leaders, the elderly, leaders of political or religious institutions, in encouraging people to create a cleaner environment. Their effect was especially noticeable in the cases where finances were not an obstacle, yet facilities were not created or not well maintained. Importantly, to

succeed in these ODF programmes, there needed to be the engagement of a larger number of institutions, including administrative bodies which can mandate construction of toilets as a condition for obtaining official certificates and licenses.

RCE Bangalore – Each of the cases proved effective as the partners addressed the challenge from multiple perspectives. RCE Bangalore advanced the awareness and skills about sanitation and hygiene among children by developing educational materials and training and through constructing infrastructure for washing hands at schools. A variety of stakeholders were engaged in the programme and in different places ranging from schools to hygiene camps. Critically, it goes beyond a one-off intervention with monitoring and documenting progress. Materials were developed in consultation with the stakeholders while the government served as distributor of the materials. Inspired by the results, the education department of Karnataka brought up this initiative to 7,500 schools across the state. While addressing the key problem of hygiene and associated diseases, the project encouraged and practiced the growing of food using water resulting from hand washing, and it also engaged children in gardening and in waste management. The programme improved sanitation, nutrition, and attitudes towards environment and health.

RCE Kunming – The RCE worked with the Human Value based Water Sanitation Hygiene Education (HVWSHE) programme promoted by UN-HABITAT. In contrast with Bangalore the challenge that triggered the programme was a scarcity of water in the region, accelerated by the rapid development of the economy and expansion of Kunming city. This in turn had led to deterioration of water quality. Water and health-related education were seen as critical not only from the perspective of effective water utilisation, but also for instilling values critical for sustainable development. The objective of the RCE programme was to enhance teachers' ability to deal with HVWSHE through the development of teacher learning materials. The result of the project was a handbook that focuses on attitudes and skills as well as values needed. Questions of water scarcity, hygiene, sanitation, gender, and responsibility were used to break away from a single (traditionally environmental) theme attributed to water. They also implemented new tools for analysis of the materials. The project had an element of health promotion through workshops (popularisation) as well as through its integration into the formal curriculum. Overall, the ambition of the project was to enable teachers to go beyond a single specialisation and beyond the classroom.

4.3. Nutrition

In this section three projects, one on community intervention, one on a sustainable nutrition approach, adapted by a city, and another on a school meal programme are covered.

RCE CREIAS-Oeste – Working with data from national and international research and policy frameworks as well as with the knowledge of local stakeholders, RCE CREIAS-Oeste developed educational processes, aiming to expose deficiencies of unsustainable food systems, and to facilitate healthier and environmentally friendly eating habits. The strategy of creating new knowledge was to use food itself through eco-gastronomic presentations based on good, clean and fair food production practices. Educational activities, ran in formal and non-formal settings, took a variety of forms – workshops, eco-meals, talks, live cooking events, contests, and worked with a vast array of products. The project was enthusiastically received by school children, teachers, and the general population and is expected to increase demand for more sustainably produced products, and awareness for food-related health issues.

RCE Munich – Through the successful programme of sustainable nutrition in the city of Munich, the RCE showcases how municipalities and governments can collectively develop political will, and creatively engage in supporting sustainability in nutrition and well-being. The case highlights the importance of nutrition as a key sustainability entry point for transformative learning in both formal and informal education. The project harnessed the strengths of nutrition sciences, development cooperation, and environmental education, targeting students, dieticians and interested consumers from the global south. Reflecting on the diverse elements of social and ecological determinants of nutrition and health as well as the importance of sustainable production and consumption and food supply chains, the authors stress the importance of the role of educators and trainers for nutritional sustainability in terms of preventive health, social justice, equitable partnerships and enjoyable living. Knowledge, expertise and resource sharing are critical in multi-stakeholder development partnerships. The study also shows how to develop continuous assessment of effectiveness and course correction for improving community actions.

RCE Mindanao – Schools have a prominent role in imparting basic life skills on health, hygiene, and nutrition not just among students, but also with a percolating effect among communities. In many countries such programmes of nutrition and hygiene education have had a long-term impact on well-being. The school vegetable garden programme called The Vegetables Go to School

Project: Improving Nutrition by Agricultural Diversification (VGtS) is a programme in Africa and Asia for addressing malnutrition among young children. By showcasing the experience of the RCE, the case highlights how the programme is addressing multiple dimensions such as malnutrition, values of water, sanitation and hygiene, livelihood education and shared responsibilities of community development. With research data from sixteen schools in the region, the study also shows the impact of the programme within the communities.

The publication draws on diverse approaches of RCEs emanating from diverse cultural, social and economic contexts. The analysis shows several nodes of critical engagement for advancing the SDG agenda of ensuring healthy lives, and promoting well-being among communities. In addition to the SDG reflections, the authors have attempted to reflect the case studies based on several milestones in health education, as well as sustainability-related multi-lateral decisions. These include the Alma Ata Declaration, the Ottawa Health Charter and various deliberations on health promotion that succeeded in health for all policies, the UNDESD and GAP.

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SEEDS OF PROMISE*

Norman Christopher, Cynthia McCurren, Tom Sanchez and Ronald Jimmerson.

Background

The city of Grand Rapids, Michigan, is the second largest city in the state of Michigan, with a population of 195,000 people. In 2007, the City of Grand Rapids (*www.grcity.us*) and the Grand Rapids Community Sustainability Partnership (*www.grpartners.org*) received acknowledgement by UNU as a Regional Centre of Expertise in Education for Sustainable Development (*www.grandrapidsrce.org*). Seeds of Promise has been a project recognised by UNU at previous global conferences.

Seeds of Promise (*www.seedsofpromise.net*) is an urban community improvement initiative in an inner-city neighbourhood community within Grand Rapids. It contains 5,000 residents in its focus area with a demographic breakdown of 65% African American and 25% Hispanic and Latino citizens. Nearly one third of the current Seeds of Promise residents also live at or near the poverty level. Currently, there are 32 neighbourhood associations within the city of Grand Rapids. Seeds of Promise is envisioned as the next transformative self-sustaining neighbourhood model whereby residents develop their own strategies for overall community improvement, are trained and empowered to act, track individual and community progress in specific impact team areas, and build trustful working relationships and partnerships with community stakeholder organisations. Today, Seeds of Promise has more than 50 endorsing partner stakeholder organisations that actively provide knowledge, expertise, support and resources to the Seeds of Promise residential community.

Seeds of Promise is unique in that it has been developed and built on empowerment and engagement strategies, not complacency; creation of wealth and prosperity, not reliance on federal programmes; self-transformation and self-sustainability, not entitlement; and resident-driven grassroots decision-making, not top-down management and control.

> Seeds of Promise is envisioned as the next transformative self-sustaining neighbourhood model

The roots of Seeds of Promise go back more than ten years, starting first as a community outreach project between two churches, one from the inner city and the other from a suburban community, with a common goal of youth engagement and development. Over the years, the Seeds of Promise residents have defined their own desired sense of quality of life and well-being through individual community surveys. Their well-being can now be determined by individual and community improvement in the following impact areas:

- Job and wealth creation
- Housing
- Educational attainment
- Entrepreneurship
- Public safety
- Ministerial
- Health, wellness and nutrition

Today, approximately 30 residents have been trained in leadership, administration and project management, and actively participate in the decision-making process while gaining experience in their roles, along with the endorsing partners that also serve on the impact teams. Health, wellness and nutrition has been recognised as a critical impact area for improvement by the residents and community citizens.

The overall vision for Seeds of Promise is to develop a self-sustaining neighbourhood with an improved quality of life and well-being evidenced by residents.

The desired outcomes for measuring impact include:

- Youth are succeeding in learning and life
- Families are functioning effectively
- Adults are engaged in liveable wage employment
- Neighbourhood is safe to live, work and play
- Residents direct the improvement strategies
- Operations need to be self-sustaining within five years
- Residents are committed to a wellness-based lifestyle

* *www.seedsofpromise.net*

To further the progress of Education for Sustainable Development in Grand Rapids and the inner-city neighbourhoods such as Seeds of Promise, framing community health and wellness in the context of the United Nations Sustainable Development Goals (SDGs) provides connectivity to global issues, development of solutions for complex community problems, and the establishment of community-based learning outcomes and opportunities. Some of the key SDGs are Goal 3 "Ensure healthy lives and promote well-being for all at all ages"; Goal 4 "Ensure inclusive and equitable quality education and promote lifelong opportunities for all"; and Goal 10 "Reduce inequality within and among countries". Cities, communities and neighbourhoods could often utilise the United Nations SDGs as an overarching framework for discussion and establishing integrated sustainability plans for their project work that directly address pressing global issues.

Context of Community Health and Wellness Programme

Healthcare is a continuing national, regional, and local topic of great discussion and concern. Issues and aspects related to healthcare include access, affordability, cost, and coverage. To set the stage, relevant background information provides a basis of understanding and context. Emergency (ER) visits in the U.S. increased to 130.4 million people in 2013, with 37.2 million visits being attributed to injury. However, only 9.3% of ER visits or 12 million people were admitted to a hospital. Moreover, approximately 15% of those visiting an ER have no insurance coverage (*FastStats, 2017*).

The cost of an ER visit has also risen dramatically. The National Institute of Health study in 2012 estimated the cost of an ER visit at $1,233, with other estimates and studies projecting that cost to be as high as $2,168 per visit (*The Anderson Economic Group, 2014*). Strikingly, there were 7,000 ER visits in Michigan in 2011 for dental-related conditions. The treatments for these preventable dental conditions were estimated at $15 million, but the actual charges were $58 million. Additionally, in 2013 it was reported that there were over 72 million non-elderly people nationally that were without healthcare insurance resulting in nearly $85B in "uncompensated care" that included healthcare services without direct service pay (*Couglin et al., 2014*).

Another report indicated that there are approximately 465,000 preventable deaths a year in the U.S. from smoking, 395,000 from high blood pressure, 216,000 from obesity, 191,000 from inactivity, 190,000 from high blood sugar, and 113,000 from high cholesterol (*Schimpff, 2010*). In summary there are over 1.5 million deaths that

are preventable if we are willing to make personal lifestyle changes.

What do all these healthcare statistics tell us? And what are the major reasons for visiting an ER? Data have shown that the top ten visits include: chest pains, abdominal pains, toothaches, sprains and broken bones, upper respiratory problems, cuts and contusions, back pain, skin infections, foreign objects in the body, with the number one reason being headaches (*Sonawane, 2016*).

All of this background data and statistics point to the conclusion that many ER visits were made for treatable and preventable diseases and conditions that could be managed through appropriate preventive healthcare services, thereby saving the U.S. healthcare system additional economic burden.

Given all this background information, the healthcare providers in Grand Rapids also found that many individuals in the Seeds of Promise neighbourhood visit hospital emergency rooms for similar conditions that could be prevented and treated by other means, and that the costs to the healthcare system for hospital emergency care have increased significantly over the years. Regarding access, major healthcare providers now offer urgent and same-day care through local healthcare clinics in many of the surrounding areas of Grand Rapids. Residents within the Seeds of Promise neighbourhood, as well as other inner-city neighbourhoods and communities of Grand Rapids, also desire to see more healthcare services offered within their own neighbourhood communities.

The YMCA of Greater Grand Rapids does an exercise demonstration with youth in the Seeds of Promise area.

Seeds of Promise Resident Intervention

Health, wellness and nutrition were identified early on by the Seeds of Promise neighbourhood as an important theme of their overall well-being and quality of life. In 2012, individual community health surveys were conducted and town hall meetings were held. Survey results showed that 65% of the respondents came from the 25-55-year-old age group, with more than 80% representative of Black and Hispanic demographic groups. The results indicated that nearly 50% of the community rated their health either as poor or fair. The most troubling key community health problems identified included tobacco use, drug and alcohol use, and mental health issues. The primary reasons identified about why residents suffer from poor health were concerns for cost, lack of insurance and transportation needs. Finally, there were many healthcare topics that the residential community desired to learn more about, including vaccinations, pregnancy care, nutrition, mental health, HIV/AIDS, heart disease, exercise, drug abuse, diabetes, dental care, cholesterol, cancer and blood pressure. From these surveys, community discussion and an emphasis on wellness feedback loops, it was evident that residents wanted to learn more about individual preventive healthcare. The key question was how to provide this preventive healthcare information to both individual residents and the community at large?

At the same time, another local healthcare issue identified was that the Browning Claytor Health Centre [BCHC] (*www.mercyhealthsaintmarys.com/browning-claytor-health-centre*), operated by the Mercy Health system and located within the Seeds of Promise neighbourhood, was not being fully utilised or supported by the residents. The roots of BCHC date back to the early 1900s when Drs. Claytor and Browning served the community and pioneered the establishment of well-baby clinics. The BCHC was a family practice where physicians, doctors, nurses, nurse practitioners and medical assistants were now trained to consider the whole person, regardless of age. Over the years, problems and concerns developed with the BCHC, as community healthcare needs were not being totally addressed, and many times healthcare services were provided to residents without the needed empathy and compassion.

In 2015, additional resident survey information was obtained to address the question, "What could you do to become a healthier community?". Resident responses included increasing physical activity, such as walking or running; drinking more water; correcting food portion size; understanding food labels; following through with doctor visits; and taking the required medication. From the most

recent community healthcare needs assessment it was also determined that:

- 37% of residents indicated cost concerns are the primary reason why people do not obtain healthcare services
- 37% of residents eat fast food two to three times a week, with 4% eating fast food four to five times per week
- 40% of residents only eat fruits and vegetables two or three times per week, although the recommended servings are seven per day

When asked what the healthcare providers should know to help community members become healthier, residents answered, "Create walking clubs, year-round exercise programmes, free youth exercise programmes, increase available local exercise facilities, develop education programmes about healthy food choices and meal preparations, and offer wellness visits and hands-on peer-to-peer healthy lifestyle education programmes".

Frontline Recovery, a resident-owned addiction recovery organisation, talks with Seeds of Promise residents about their programming.

Seeds of Promise Health, Wellness, and Nutrition Impact Team

Community health and wellness issues can also be addressed through the Education for Sustainable Development – Global Action Programme (GAP). This strategic architecture enables goals, objectives and action steps to be developed that contribute to the SDGs through multi-stakeholder networks and strategic partnerships. The desired GAP outcomes include the facilitation of multi-stakeholder networks, engaging and aligning higher education for sustainable development, and developing platforms and processes that can be used on a local, regional, national, and global level.

To confront these major local healthcare issues and concerns, a multi-stakeholder group of healthcare organisations was formed that was facilitated and led by the Seeds of Promise Host Neighbour residents. Stakeholder members of this group today include the Grand Valley State University (GVSU) Kirkhof College of Nursing, GVSU Family Health Centre, Cherry Street Health Centre, Mercy Health Saint Mary's, Tandem 365, Exalta Health, Simply a Loving Touch Homecare, Kent County Health Department, Health Intervention Services, Mercy Health Browning Claytor Health Centre, Be Well Centre, Healthy Homes Coalition, YMCA, GRAAHI/Care Connect, American Diabetes Association, MSU Extension, and local residents. This team meets regularly on a monthly basis. The Health and Wellness impact team is one of seven
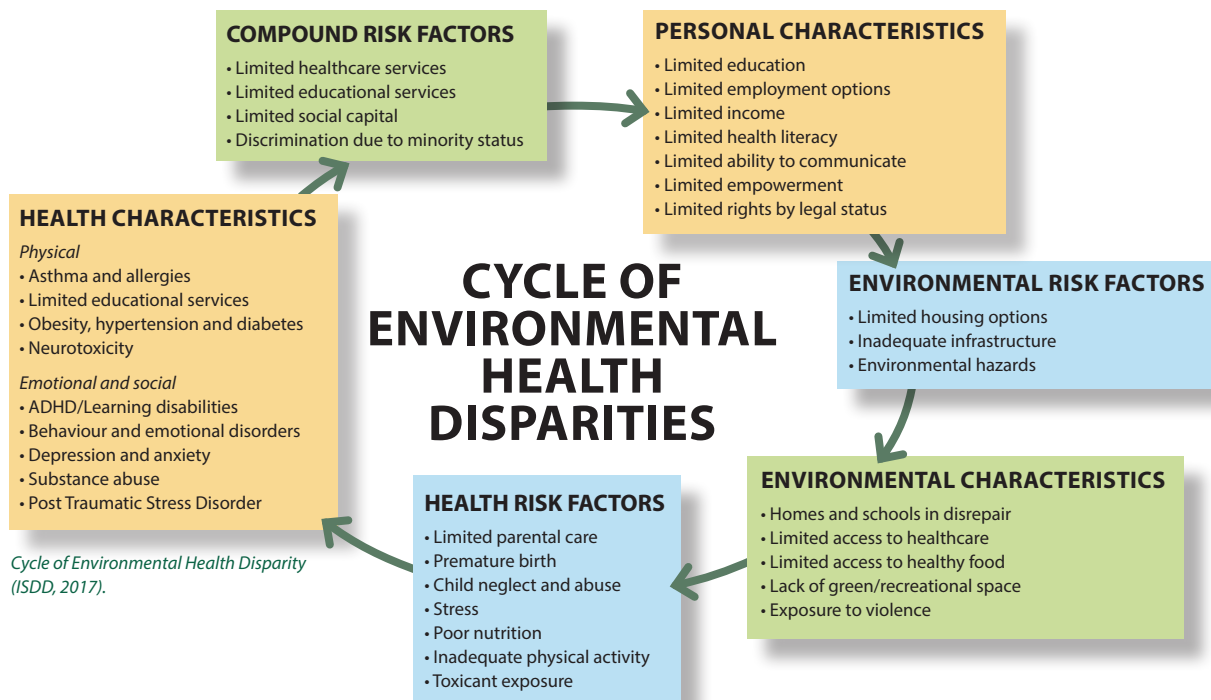
impact teams being led by Host Neighbour residents that have been trained in self-governance and leadership positions.

The Health and Wellness impact team established a mission to:

- Develop an improved healthcare delivery system that minimises the use of local hospital emergency room urgent care facilities for non-urgent conditions
- Promote a place-based proactive neighbourhood health, wellness and nutrition programme so that families, children, youth and residents can take better care of themselves
- Increase awareness and access to local healthy nutritional foods
- Establish a local community garden

Through these surveys, specific programmes were implemented to address these community resident healthcare issues. The Seeds of Promise Health and Wellness impact team serves as a local community model and to date has not been integrated into any state-wide or local healthcare system model.

The healthcare surveys also provided the insight that health disparity and health risk factors all connect and cannot be pursued as individual goals or objectives in isolation (*ISDD, 2017*).

COMPOUND RISK FACTORS
- Limited healthcare services
- Limited educational services
- Limited social capital
- Discrimination due to minority status

PERSONAL CHARACTERISTICS
- Limited education
- Limited employment options
- Limited income
- Limited health literacy
- Limited ability to communicate
- Limited empowerment
- Limited rights by legal status

HEALTH CHARACTERISTICS
Physical
- Asthma and allergies
- Limited educational services
- Obesity, hypertension and diabetes
- Neurotoxicity

Emotional and social
- ADHD/Learning disabilities
- Behaviour and emotional disorders
- Depression and anxiety
- Substance abuse
- Post Traumatic Stress Disorder

CYCLE OF ENVIRONMENTAL HEALTH DISPARITIES

ENVIRONMENTAL RISK FACTORS
- Limited housing options
- Inadequate infrastructure
- Environmental hazards

ENVIRONMENTAL CHARACTERISTICS
- Homes and schools in disrepair
- Limited access to healthcare
- Limited access to healthy food
- Lack of green/recreational space
- Exposure to violence

HEALTH RISK FACTORS
- Limited parental care
- Premature birth
- Child neglect and abuse
- Stress
- Poor nutrition
- Inadequate physical activity
- Toxicant exposure

Cycle of Environmental Health Disparity (ISDD, 2017).

Key Strategies

Place-based strategies were then developed to specifically address the community health and wellness issues of the residents.

- Improve access to primary holistic healthcare including referral of patients to the Mercy Health Dental Clinic, immunisations and preventive healthcare screenings.
- Develop an accurate and efficient process to collect, monitor and report data for clinical indicators, events and activities associated with community healthcare.
- Engage neighbourhood residents within the Seeds of Promise community to take responsibility for managing their own health and wellness activities. Efforts include peer-to-peer education and classes offered by the Kent County Health Department, YMCA and Michigan State University Extension, including "How to talk to your Doctor and Nurse" and "Understanding what your Doctor and Nurse are saying".
- Implement "Making Choices Michigan", an evidence-based community collaborative that provides free advanced care planning.
- Set a target to increase by at least 20% by June 2016 the number of patients in each racial and ethnic group that have controlled their A1C diabetes test results.
- Conduct annual Healthcare Fair days, at the Dickinson Academy School, for residents, families and children. These fairs ("Southtown's Night Out") have been held annually for the last three years, with hundreds of children and families in attendance each year.
- Develop three-hour peer-to-peer healthcare education modules within the Seeds of Promise community for families and residents.
- Establish an urban garden planning team in conjunction with GVSU students, Urban Roots, Coffee Grounds and other community team members. Preliminary sites within the Seeds of Promise area have been identified.

Many of the above strategies support the SDGs and the 2030 Agenda for sustainable development. For example, SDG Target 3.8 states, "Achieve universal health coverage and access to essential healthcare services and access to safe and affordable essential medicines for all. "SDG Target 4.7 states, "By 2030 ensure that all learners acquire the knowledge and skills needed to promote sustainable development including ESD and a sustainable lifestyle for all."

Michigan State University Extension talks with a Seeds of Promise area City Commissioner about their programmes.

Results and Progress

Seeds of Promise has demonstrated continuous improvement, achieved year-over-year progress and met significant milestones over the recent years.

- Obtained a two-year Call to Care grant totalling $200,000 from the CHE Trinity Health Community Benefit Fund to help refurbish and update the Browning Claytor Health Centre starting in 2014.
- Jointly appointed with the GVSU Kirkhof College of Nursing, one Doctor of Nursing Practice (DNP), three DNP students, three clinical nurse leader students, and eight BSN (Bachelor of Science in Nursing) students, to advance nurse-managed healthcare practices within the Seeds of Promise neighbourhood.
- Established an Interprofessional Collaboration (IPC) process of communications and decision-making that improves the healthcare outcomes of the Browning Claytor Health Centre. To that end, continuing improvement has been seen with Seeds of Promise Host Neighbours now serving on the health centre's advisory board.
- Provided 150 students per day after-school food basket meals at the Dickinson Academy School, totalling 31,068 meals in the year through the Kids Food Basket (*www.kidsfoodbasket.org*). The yearly economic impact was $35,000, factoring in the cost of the meal and volunteer service hours.
- Provided more than 4,000 lbs (1,800 kg) of food a month for 75-90 families, totalling almost 40,000 lbs. (approximately 18,000 kg) for nine months, through the Feeding America Programme (*www.feedingamerica.org*). The yearly economic impact was $80,000, factoring in the cost of food as well as the 200 volunteer hours during the year.

- Three-hundred residents and more than 20 local vendors attended the Healthcare Fair; 11 women received Mammograms, with seven receiving additional treatment; one healthcare provider signed up more residents for coverage than at any other event. Local vendors handed out many brochures and helpful hints on preventive measures and action steps to improve individual healthcare.
- 32 senior nursing students from the GVSU Kirkhof College of Nursing collectively spent 1,300 community service hours with an estimated economic impact of $35,000.
- Received 457 new patients in 2015 at the Browning Claytor Health Centre, a growth of over 35% compared to 2014.
- Impacted the local neighbourhood community through peer-to-peer resident education programmes where residents are taught healthy lifestyle skills in the areas of nutrition, exercise, substance abuse, mental health and wellness, and advanced care planning by GVSU Nurse Practitioners.
- Generated more than $240,000 of direct and indirect economic impact in 2015 for community health and wellness impact through available metrics and measurements.

Key Success Factors and Major Challenges

As confirmed by national politics, healthcare systems and healthcare reform have triggered highly energised discussions and debates on a national, regional and local level. The local healthcare issues in Grand Rapids, Michigan, have raised many questions including how to: De-politicise the continuing debates and discussions? Establish a meaningful dialogue with community stakeholders and local residents? Generate impactful co-created strategies? Determine preliminary action steps? Develop the appropriate key performance measurements for collective impact?

One key success factor has been to focus on local health issues with facts, and not perceptions or pre-conceived ideas. The ongoing resident and community perspectives and input on healthcare issues through feedback loops, community and town hall meetings, workshops and surveys have been critical to developing awareness, understanding, and prioritisation from a local inner-city resident and family perspective for long-term success. Local residents and community members have been able to identify specific prioritised healthcare needs and wants, with key action programmes now being targeted to meet these issues and concerns. Developing trustful working

relationships among local healthcare providers and community residents has been an absolute necessity.

A second key success factor has been the desire to shift healthcare services from a reactive strategy to a more preventive approach, whereby local residents take greater ownership of their own healthcare issues rather than relying on emergency and urgent care facilities when needed. Emergency and urgent care facilities are expensive to use, and in many instances preventive approaches can be taken by individuals to minimise their use through various educational, nutritional and wellness programmes offered within the local community. Significant interest and willingness has been expressed by local hospitals and healthcare providers in developing more focused and localised community-based healthcare strategies to alleviate costs, minimise the misuse of emergency and urgent care facilities, while empowering residents to take more ownership for their own healthcare and well-being.

> *Trustful working relationships among local healthcare providers and community residents has been an absolute necessity.*

There has also been a dramatic and intentional effort to transition healthcare services, training and education to a localised and community-centric model. Each hospital and healthcare service provider wants to attract and retain new patients from within the various neighbourhoods of Grand Rapids. A major challenge has been to have the interested healthcare providers mutually develop and co-create new community-based healthcare strategies, including the opportunity for nurse-managed healthcare with community residents and Host Neighbours who are the key decision makers. Using the Deep Listening process, the endorsing partner healthcare providers must first become aware and understand local healthcare issues from a local resident and community perspective. After obtaining this understanding, healthcare providers must also co-create new healthcare solutions that benefit the community and local residents, and get their approval for implementation.

Cross-Cutting Themes

Overall, the continuing progress could not have been made without establishing trustful working relationships within the health, wellness and nutrition impact team including stakeholder partner organisations and local residents. Inclusive and diverse collective input and feedback have been obtained from many community stakeholders, including local residents and families, local hospitals, nurses, health practitioners, healthcare clinics, urgent care facilities, health educators, local universities such as the Kirkhof College of Nursing at GVSU, and others. This collective input, which is considered to be inter- and

intra-disciplinary, has helped build mutual trust, awareness and understanding within the community on local healthcare issues, including what solutions are practical strategies for consideration. This collective information has also enabled the distribution of knowledge, capital and best practices as collective shared resources to be used in the development of this transformational healthcare solutions process.

This ongoing community healthcare programme and initiative meets several objectives of the Global Action Programme (GAP) Framework by integrating sustainability practices into education and training environments through whole-institution approaches; increasing the capacity of educators and trainers; and encouraging local communities and local residents to develop community-based ESD programmes.

The transition from a reactive healthcare service system, where treatments are received many times at hospitals and emergency rooms for ailments as they occur, to a preventive healthcare system where healthcare services are provided in local neighbourhood communities with individuals taking responsibility for their own precautionary and protective health and wellness measures, is well underway in this neighbourhood community. The Seeds of Promise community continues to identify additional resource gaps that must be addressed, such as greater access to locally produced food, as well as ethnic and traditional food, and the need for a local pharmacy.

Moving forward the Health and Wellness Team has established a number of specific future goals and objectives in this transformational healthcare solutions process, namely:

1. Increase access to insurance coverage within the Seeds of Promise Impact Zone.
2. Decrease the use of local hospital emergency room visits for non-urgent conditions.
3. Reduce the number of residents who prefer caloric beverages such as pop, juices and sweet drinks over water and other non-caloric beverages as their daily fluid intake.
4. Determine a location where community members can purchase and sell fresh seasonal produce and other products based on identified resident needs; and provide health, wellness and nutrition information to all who visit the market.
5. Increase community members' knowledge of services available in the neighbourhood to assist with chronic disease management.
6. Hold a community Healthcare Fair with a wide variety of healthcare services that will attract at least 300 resident attendees.
7. Identify Seeds of Promise neighbourhood residents who receive healthcare through Cherry Street, and risk-stratify the need for Care Management Services.
8. Increase the number of residents with improved access to tobacco-free environments.
9. Increase resident participation in the Community Health Needs Assessment process.

Year-on-year progress continues to be made, and it is anticipated that this neighbourhood health, wellness and nutrition initiative will serve as a learning model for other communities.

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EMPOWERING PEOPLE WITH SPINAL CORD INJURY THROUGH PEER MENTORING

Julia Patrick Engkasan, Peter Tan, Nazirah Hasnan and Bathmavathi Krishnan.

Empowerment

Patient empowerment refers to a process where people gain greater control over decisions affecting their health (*Anderson and Funnell, 2010*). It allows them to take control of their life, to set goals and to make positive choices. In the context of health, empowered patients:

- **Understand their health condition and its effect on their body**
- **Understand the need to make necessary changes to their lifestyle for managing their condition**
- **Participate in decision making with their healthcare professionals**
- **Actively seek out, evaluate and use the information about their illness/disability**
- **Make informed choices about treatment options**
- **Take responsibility for their health and actively seek care only when necessary**

This chapter is about a project to empower people with spinal cord injuries (SCI), and describes how this can be achieved through peer mentoring. The project is supported by a Community Engagement (CE) Grant from the Community and Sustainability Centre (UMCares). UMCares, a part of the University of Malaya, is the secretariat of the Regional Centre of Expertise on Education for Sustainable Development (RCE) Central Semenanjung, the second RCE in Malaysia. Specific roles and objectives of RCE Central Semenanjung are:

- Imparting training on Education for Sustainable Development (ESD) and green technology to educators, local authorities and community
- Developing management plans for ESD through collaboration among stakeholders
- Generating regional ESD good practices guidelines applicable to the community
- Promoting sustainable development practices in the community

> "A spinal cord injury (SCI) is a life changing event. In an instant, people who sustain SCI become paralysed in the limbs and lose many of their body functions, such as mobility and their bladder and bowel functions."

Since the RCE Semenanjung was placed under the administration of UMCares, the University of Malaya has provided it funding for two consecutive years to support community-based projects. These projects are led by academic staff who are driven to either solve or add value to the needs of the community, through their expertise or research outcomes to ensure high impact. To date, RCE Central Semenanjung has had 30 community-based projects and 13 school-based projects, funded by the University of Malaya, five projects supported by the Ministry of Higher Education, and three projects sponsored by the Ministry of Finance.

The following section describes what a spinal cord injury is, and aims to help readers to understand the impact of this condition. The next section describes University of Malaya's academic initiatives to help empower this population. A description of how this peer supported project was initiated and performed follows. The chapter ends with the authors' reflections on the challenges, and on the elements, that could influence the success of the project.

Spinal Cord Injury and its Impact

A spinal cord injury (SCI) is a life changing event. In an instant, people who sustain SCI become paralysed in the limbs and lose many of their body functions, such as mobility and their bladder and bowel functions. (*Sezer, Akkuş, and Uğurlu, 2015*).

Empowered patients understand their health condition, the need to make necessary changes to their lifestyle and participate in decision making with their healthcare professionals. The spinal cord is situated in the spinal column and extends down to the L1-L2 vertebral level, ending in the conus medullaris and subsequently in the

cauda equina. There are 31 pairs of spinal nerve roots; starting at the top, eight cervical, twelve thoracic, five lumbar, five sacral and one coccygeal. These nerves serve the muscles, the skin and the internal organs, such as the bladder and the bowel. An intact spinal cord enables a person to move his/her hands and legs, feel pain and control the urination and defecation process. When a spinal cord gets injured, the functions below the level of injury are affected. The degree of impairment depends on the extent of the injury. In general, the more intense the spinal cord lesion, the more extensive the range of impairment will be. Common symptoms are paralysis of the muscles, loss of sensation, and loss of automatic body functions such as breathing, heart rate, blood pressure, temperature control, bowel and bladder control, as well as sexual function.

For a person with SCI, thinking about the challenges of the future can be daunting. Many know nothing about SCI prior to their injury. The family, too, in most cases is affected greatly; caring for someone with SCI can be overwhelming. SCI is also associated with increased financial needs and, depending on the impairment and supportive environment, the risk of productivity loss. Persons with SCI need to undergo in-patient rehabilitation, where they learn about SCI, the associated common medical issues and how to manage them. SCI is a chronic condition and the ability to perform self-care to maintain good health, and prevent potential complications such as urinary infections, pressure ulcers and metabolic diseases is of paramount importance. Persons with SCI require access to services in the social, economic, and educational sectors, in addition to the health sector, to lead a full and productive life.

The exact figures of the prevalence of SCI in Malaysia are not available. A single centre study on epidemiology of SCI in Kuala Lumpur Hospital revealed that the majority of people with SCI are young men (under 40 years of age) of low socio-economic status (*Ibrahim et al., 2013*). At present, a nationwide study is under way to investigate the well-being and experience of persons with SCI who are living in the community in Malaysia. This study aims to determine the extent of health and social issues persons with SCI face in their daily lives.

Empowerment in the Context of SCI

Persons with SCI and their family members need to be empowered so that they are able to look after the health of the affected person to the greatest extent possible. Patient empowerment is now widely recognised as a fundamental pillar of healthcare in the 21st century. The former Director General of the World Health Organization (WHO) Margaret Chan and the former President of the World Bank Group

Entrance to the Exhibition World SCI day; wheelchairs were used in abundance to symbolise accessibility.

Robert Zoellick, in the preface of the World Report on Disability (WRD), stated that society must empower people living with disabilities and remove the barriers that prevent them from participating in their communities (*World Report on Disability, 2011*). The Global Disability Action Plan (GDAP), published in 2015, also shares the same sentiment; the design and implementation of the action plan are based on and guided by a human rights based approach, including empowerment of persons with disabilities (*WHO Global Disability Action Plan, 2015*).

Persons with disabilities must also participate actively in making decisions about their care, as they are the experts about their specific disability and personal situation, and hence the best persons to make the decision. In line with Article 4 of the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD), persons with disabilities, through their representative organisations, should be fully consulted and actively involved in all stages of formulating and implementing policies, laws, and services that relate to them. International Perspectives on Spinal Cord Injury (IPSCI) also recommend that empowerment of people with SCI and their families is one way to help them have better lives.

Empowerment in the Context of Local Policy

Malaysia ratified the Convention on the Rights of Persons with Disabilities on 19 July 2010, thus joining the global community in affirming the human rights of persons with disabilities. Prior to that, in 2007, the Government of Malaysia had formulated the Policy and Plan of Action for the Persons with Disabilities (*Jabatan Kebajikan Malaysia, 2016*). This Plan of Action, which was drafted based on the essence of the Convention on the Rights of Persons with Disabilities (CRPD), served as the foundation to ensure persons with disabilities in the country enjoy full and effective participation in society, on an equal basis with others. In relation to GDAP, the Family Health Development Division of the Ministry of Health initiated The Malaysian

Visitors at the exhibition.

Healthcare Programme for Persons with Disabilities (PWDs), and has pledged to strengthen the programme and services for them. In addition, the national health policy supports the concept of patient empowerment, self-care and patient engagement in treatment decision making.

In the 10th Malaysian Health Plan, the Malaysian government identified "Empowerment of individuals and community to be responsible for their own health" as one of the four key areas for the health sector (*Ministry of Health, 2010*). The government aims to increase health literacy through educating individuals and communities with adequate knowledge and skills for self-care. In addition, the Health Research Priorities in Malaysia for the 10th Malaysia Plan encouraged researchers to improve the focus of their research by identifying the specifics of information or evidence that is required to improve healthcare through behaviour change and empowerment of the Malaysian community.

Currently, the two main players considering community empowerment are the Health Education Division of the Ministry of Health (MOH) and the newly formed Malaysia Health Promotion Board. In general, hospital policy acknowledges the patients' right to access information and participate in medical decision making. Thus, not only has empirical front-line research in SCI underlined the need to target patient empowerment, the Malaysian government acknowledges the importance and relevance of the issue by including it in their health planning and making a specific statement about it in their policy.

Current Situation

Persons with SCI in Malaysia, however, are so far not actively engaged in making treatment decisions, as much as they should or would like to (*Engkasan, Ng and Low, 2014, 2015*). A study in 2014 explored how the decision on the method of bladder drainage was made for persons with SCI in five public hospitals in Malaysia. The study

reported that healthcare professionals dominated the decision making process. In this paternalistic approach, the healthcare professionals made the decision for the patient without much patient engagement. An earlier study on rehabilitation and doctors' attitudes towards ethical issues reported that they exhibited paternalistic behaviour when it comes to advanced directives (*Mazlan and Engkasan, 2011*). As the patients did not receive adequate information about the available treatment options, they found it difficult to participate in the decision making process. The authors agree that persons with SCI and their families do have difficulty to access, understand and use the health information they receive, especially in the early stages of their injury. Providing meaningful and reliable

> Health promotion interventions that empower people with disabilities to better manage their health can have a significant impact on health, ability to function, community participation and quality of life.

information is a necessary starting point to building health literacy. The authors also believe that health information material, in its content and format, should be sensitive to differences in cultures, gender and individuals.

Possible Solutions

Health promotion interventions that empower people with disabilities to better manage their health can have a significant impact on health, ability to function, community participation and quality of life. There are many options as to how patients could be empowered. Three options were selected to step up the scale of SCI patient empowerment, which may be implemented in combination or individually.

(i) A Health-Literate SCI Community
Health literacy is defined as "the cognitive and social skills and ability of individuals to gain access to, understand and use information in ways which promote and maintain good health" (*Nutbeam, 1998*). Such interventions aim to provide patients with timely and appropriate information to enhance health-related knowledge, skills and behaviour, and thus enable them to make informed decisions. The interventions could also encourage the appropriate and effective use of healthcare services, including greater uptake of preventive and screening services.

Studies have found that improving health literacy empowers patients to play a more active role in managing their health. Patients who understand their health problems and know about various treatment options are more likely to be involved in making healthcare decisions (*Koo, 2006; Ishikawa, 2008*). Governments should therefore provide supportive environments that foster the growth of health literacy. Improving health literacy of persons with SCI calls for providing a structured and multidisciplinary health education programme or SCI information package to ensure that their basic right to high quality information is met. In addition, it is essential to help them understand the health information and know how to use it.

Peer mentor Law King Kiew shared her experience on being a person with SCI in the Peer Support Group activities held on 24th February 2017.

(ii) Peer Mentoring or Peer Support Programme

Peer mentoring is a process in which an individual who has had a similar experience helps another person currently coping with a similar life event. Peer mentoring programmes have been developed to aid people with a variety of medical conditions and physical disabilities, and also to help their family members. Volunteer patients are recruited and trained to engage with new patients and discuss with them issues such as informed consent, making decisions, privacy and managing medication. A peer-mentoring programme for individuals with SCI provides an alternative form of support during both the early and later phases of adjustment in the community (*Ljungberg et al., 2011*), and helps the newly injured persons to better adjust their lives to the new disability (*Boschen, Tonack, and Gargaro, 2003*).

Peer mentoring programmes have been implemented in several institutions in the United States and Australia. Key elements of SCI mentoring programmes include the provision of social support, the strengthening of self-efficacy beliefs, community integration and monitoring of secondary conditions (*Powers, Sowers, and Tucks, 1995; Sable, Patti, and Lee, 2000; Veith et al., 2006; Isaksson, Lexell, and Skar, 2007*). Secondary health conditions are those that arise as a consequence of longstanding spinal cord injury, such as osteoporosis, premature diabetes, cholesterol related problems, and non-healing wounds.

Peer or SCI support groups can help persons with SCI feel less isolated, develop friendships, share thoughts and ideas, and learn how others are coping. Most people find it rewarding to talk with others who have been through a similar experience. Often peer mentors are former patients with SCI who have made a successful re-entry into the community. These individuals have an interest in counselling and have the skills necessary to form positive relationships with patients and families. They serve as role models for newly injured patients, through involvement in sports, participation in social activities, suggestions, education and counselling.

(iii) Shared decision making approach when making treatment decisions

Shared decision making (SDM) is an emerging medical decision making model in which "clinicians and patients share the best available evidence when faced with the task of making decisions, and patients are supported to consider options, to achieve informed decision" (*Charles, Gafni, and Whelan 1997, 1999*). In SDM, both clinicians and patients are experts; the former have valuable knowledge about the medical condition and treatment options, whereas the patient is an expert in his or her own life who knows best how the disease and consequences of a treatment option may affect their daily life (*Coulter and Collins, 2011*).

Healthcare systems around the world are becoming increasingly interested in strengthening the role of patients, as it is believed that such involvement improves the patients' quality of life and leads to a sustainable health system (*Chewning et al., 2012; Cullati et al., 2011; Flynn, Smith, and Vanness, 2006; Tariman et al., 2010, Guadagnoli and Ward, 1998*). Persons with SCI should be therefore empowered to perform this decision making responsibility by creating an environment that supports SDM. The University Malaya SCI Empowerment Taskforce decided to embark on a peer support group programme for persons with SCI, as described below.

University Malaya Peer-Support Group for Persons with SCI (PSG-SCI) Project

University Malaya Medical Centre (UMMC) provides comprehensive in-patient and out-patient spinal cord injury rehabilitation services, but these lack the component to enable the patients to visualise a life out of the hospital. This is best delivered by those who have experienced the challenges of living in the community with an SCI. The formation of a peer support group service would bridge this gap by connecting patients and their family members with trained volunteers who can share their experiences. This service could complement the professional services provided in UMMC, leading to a holistic and meaningful cooperation between the hospital and the patients. Being a peer mentor, however, is a heavy responsibility for which one needs to be equipped with the right knowledge and attitude. A training and certification procedure is needed to ensure that the peer mentors are competent to handle this task. In addition, it is important to have a consistent baseline training for peer mentors throughout the country in the future.

Realising its importance, in 2016 a peer support group was set up for the SCI (PSG-SCI) project. The project aimed to provide training and certification to volunteers, conduct 'Train the Trainers' sessions to run this training in the future, form a peer support group unit within the Malaysian Spinal Injuries Association (MASIA), and conduct serial workshops or teaching sessions to enrich peer mentors' knowledge about SCI, disability rights and policy. A collaboration was undertaken with MASIA, a non-profit, non-religious, non-political national organisation, which is a self-help group for people with SCI and their families. It is run by people with SCI and their friends, and aims to assist individuals with SCI to integrate and participate effectively in society. Persons with SCI who are successful in their own way were asked if they would like to be part of this initiative. Most of them have been involved in patient related activities organised by UMMC and were proud to be peer mentors. In addition, MASIA was requested to help identify suitable peer mentors. The response was overwhelming and it was felt that this was due to the good doctor-patient relationship as well as individual awareness for the need of this service.

In this project, three events were conducted in 2016 – an exhibition to increase public awareness about SCI and two workshops. The workshops were funded by a grant from UMCares (Community Engagement Fund) and the Department of Social Welfare. MASIA was formally involved in all events. As the national society, they seemed to be most suitable to lead a peer support group for the SCI population in Malaysia.

One of the posters exhibited. Rizal portrayed a 15-year journey living with an SCI. He shared his aspiration and motivations in this poster.

(i) Exhibition titled "I am … and this is my SCI story"

This event was held on 5 September, the World SCI Day. The aim was to increase public awareness on what people with SCI are able to achieve in life. Fifteen posters, each titled **"I am … and this is my SCI story"**, described the journey and achievements of many SCI individuals.

(ii) Peer Support Group for Persons with Spinal Cord Injury Workshop I

The first workshop was held from 22-24 October 2016. It was organised by UMMC and supported by a grant from UM. There were three international speakers: a peer counsellor, a psychiatrist from the Indian Spinal Injury Centre in New Delhi, and a psychologist from USA. The main objective of this workshop was to introduce the participants to the basics of counselling, a range of peer support activities and the psychological impact of SCI. The participants had the opportunity to role-play counselling on actual patients. On the last day, the group discussed how they planned to organise themselves in future, given that it would incur the costs of money and time of the volunteers.

Seventeen persons with spinal cord injury participated in the workshop and provided peer support when needed. They will be able to provide counselling on general areas of coping with the disability, but will need further training on medical issues. The UMMC Spinal Cord Injury Rehabilitation Team has agreed that the peers will be included in their monthly medical education session.

A collaboration was undertaken with MASIA, a non-profit, non-religious, non-political national organisation, which is a self-help group for people with SCI and their families.

Mohd Rizal receiving his certificate of completion from Mr. Shivjeet Raghaw, surrounded by Prof. Stanley Ducharme and Dr. Shashi Kumar.

Participants of the second workshop together with Peter Tan (front row – white shirt) and Associate Prof. Julia Patrick Engkasan (last row in red blouse).

(iii) Peer Support Group for Persons with Spinal Cord Injury Workshop II

The Malaysian Spinal Injuries Association organised the second Peer Support Workshop. At this three-day workshop held from 27-29 December 2016, 15 members of the association learned in theoretical and practical sessions about peer support. The topics covered the techniques of peer support, understanding disability, empowerment and medical rehabilitation. At the end of this workshop, the participants discussed how the peer support group should move forward. MASIA agreed to initiate this peer support group.

Success and Challenges

As a start, the Spinal Cord Injury Rehabilitation unit decided to conduct formal activities every four months. The first peer support activity was held on 24 February 2017, where two peer mentors shared their experience on the topic: "Adjusting to life with SCI at home". This was attended by patients who were undergoing rehabilitation in the hospital as well as at home. The meeting also provided a platform for persons with SCI to meet.

Some challenges in delivering the peer support service are foreseen. At this point, inadequate support to the mentors to perform their job is a major constraint. Peer support work costs money and is time consuming. Currently there is no allocation to reimburse travel and related expenses. In other countries peer mentors are usually supported by the related association or society. Peer mentors do expect some financial support to perform peer support activities and this poses a challenge

to continue the project. Apart from the group activities described above, a peer mentor is expected to meet the newly injured individual on a regular basis. Face to face meetings might be difficult as many of the peer mentors are working and have other commitments. All these issues pose a challenge to the individual peer mentor to continue providing this service.

Peer mentors typically have access to information about clients' lives, probably some details on their injuries and personal life. Though this is obtained usually directly and seemingly voluntarily from the patients during the peer mentor process, there is concern that the mentors may reveal this information to unrelated parties. It is important that the organisation have clear guidelines on how peer mentors should handle sensitive information. They must understand and comply with patients' right to privacy and confidentiality, and understand exceptions to these rights. Setting the boundaries is also seen as a challenge; the counselled patient may seek the peer's opinion on medical treatment. The peer mentors may give conflicting information to that provided by the health personnel. Mentors, however, may lack the ability to appreciate that the specific situations and backgrounds of the patients could influence the treatment options. Peer interactions would therefore need to be limited to sharing of experiences of non-medical issues such as going back home, adjusting to life with SCI, returning to work and recreational activities. A manual or handbook for peer mentors indicating what they should and should not do would be a useful tool. Peer and health professionals' feedback was obtained to evaluate the success and usefulness of this peer support programme.

Law King Kiew presented a 'Graduation' certificate to Mohd Sufi who had successfully completed his in-patient rehabilitation in UMMC.

Reflections

The drive to embark on this project came from the realisation that patients with a recently acquired disability need help to cope with their condition. Over the past decade or two, health strategy is changing, whereby the community is encouraged to take care of themselves. It was felt that it is an academic social responsibility (ASR) to build learning communities, which would eventually lead to community social development. Academics have the advantage of knowledge and science, in this case the science of successful mentor support activities. A successful empowerment process for a person with SCI requires close interaction among the health professionals, the patient and the peer mentor. *Figure 1* illustrates the types of interactions among and between the three parties.

Figure 1. *The different levels of interactions between health professional, peer mentor and new peer. This model also acknowledges some issues are best covered by only peer mentor whilst some are best covered by both peer mentor and health professional (darkest shaded area).*
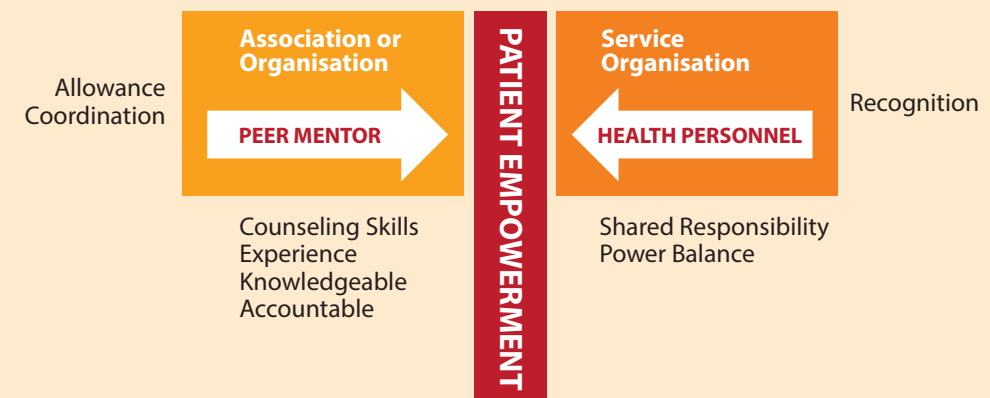

Figure 2. *Elements influencing the effectiveness of the peer mentoring and empowerment process.*

It shows the types of relationships the three groups may have; some aspects of a person's life are best dealt with from the help of the peer mentor, while some would be best covered by both mentor and health professionals. This model also acknowledges that peer mentors and health professionals may not be able to cover every aspect of a patient's needs considering that their life experiences might not be the same as those of the patient. The authors hope that this shared responsibility and partnership would lead to efficient and sustainable healthcare.

Both peer mentors and health professionals play important roles in the patient empowerment process *(Figure 2)*. The peer mentors need to be competent in counselling, must have the necessary experience and knowledge, and must be accountable. Health professionals must be willing to share the responsibility but at the same time maintain a power balance in the care of the new patient. Peers preferably should work within an organisation that provides them with administrative and financial support. The health organisation, on the other hand, must give peer mentors and the peer support programme due recognition and health information support.

One of the core elements of RCEs is the engagement of multiple stakeholders, which provides a sound basis to this project. This project involved academics, researchers, clinicians, and consumers from home and abroad. The main project partner, MASIA, was actively involved in developing strategies on how this peer support programme would take off in the future.

Another stakeholder that supported this project was the University Malaya Medical Centre (UMMC), which permits peer support activities on its premises. In the future, the plan is to formalise the involvement of peer support activities as part of the services offered in this hospital. As a stakeholder, UMMC plays a significant role in the success of this project. However, as the project moved into implementation mode, it was realised that numerous issues needed to be researched, and this fits in with another core element of an RCE, which is research and development. In the future, the team would strongly consider research on different methods of peer support service delivery. As evidenced by this project, the RCE played a significant role in supporting, guiding, and implementing a sustainable community project.

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CONTRIBUTIONS OF REGIONAL CENTRE OF EXPERTISE: BORDERLANDS MÉXICO-USA'S COLLABORATORS IN HEALTH, SANITATION AND NUTRITION IN THEIR LOCALITIES

Carolina López C.

Introduction

The borderlands region between México and the USA is characterised by deeply rooted sociocultural and economic interdependence, with goods and people crossing the international boundary as they go about their daily lives. The continuous human mobility gives rise to the movement of diseases and pathogens, which are also shared across the border. While México's northern states are among the wealthiest in the country, Torres (*interviewed on 8 July 2017*) opines that factors affecting health on the US side include the poverty faced by many citizens and migrants, current American migratory and medical policies, and the lack of culturally relevant and linguistically competent services to aid individuals and families with both preventive and reactive health-related issues that they may face. The present article aims to situate the community health projects of Regional Centre of Expertise Borderlands México-USA's (RCE BMU) collaborators within the context of healthcare policy in the USA. It provides a summary of collaborator-led health projects and assesses their impacts in the South-western border states. Project outcomes are then analysed in light of the United Nations Sustainable Development Goals (SDGs). The report ends by exploring how the newly minted RCE BMU can provide meaningful support to its collaborators and to the communities which it serves as it attempts to promote human health and well-being in the region.

RCE Borderlands México-USA and Collaborators Engaged in Community Health Projects

Acknowledged by the United Nations University on 8 December 2016, Regional Centre of Expertise: Borderlands México-USA works collaboratively with local organisations and individuals for the improvement of health, sanitation and nutrition in the borderland region. Among its collaborators, the Alliance of Border Collaboratives (ABC); Dr. Eva Moya, Associate Dean, College of Health Sciences, Department of Social Work, University of Texas at El Paso (UTEP); Dr. Mark Lusk, Provost's Faculty Fellow-in-Residence, Department of Social Work, UTEP in El Paso, Texas; and R.N. Charisse Yenko, Emergency Room Nurse and Social Advocate in Salinas, California, are engaged in the important initiatives described in this paper. Through RCE BMU it is hoped that a Human Health and Well-being Support Network is evolved according to the needs of professionals and communities, and to offer a channel through which their voices can be heard by policymakers at the local, the national and the global levels. A detailed discussion of how RCE BMU might best serve communities and health sector professionals, is found at the end of the present chapter.

The State of Healthcare on the US Side of the Border and Its Impacts on Marginalised Populations [1]

The healthcare system in the United States is characterised as having state-of-the-art medical technology, with a wide availability of top-of-the-line drugs for treating patients' illnesses. Healthcare is not, however, recognised as a basic right under US law, and there is no universal healthcare system to meet the needs of all.[2] Instead, there is a strong tendency toward private insurance coverage, and "the duly insured receive some of the best medical care in the world, while millions of the country's less-well-off citizens and residents lack any form of medical insurance" (*Chua, 2006*).[3] Currently, the United States-México Border Health Commission (USMBHC) estimates that 23% of individuals residing on the US side of the border lack medical insurance of any kind (*USMBH, Retrieved 7 June 2017*). Since Federal Law requires hospitals to provide emergency services regardless of citizenship, legal status or ability to pay (*ACPE, Retrieved 30 June 2017*), the estimated 35.4 million uninsured nationwide have access to the sole medical resource of Hospital Emergency Rooms in the event of illness, accident or any other reason for which

Charisse speaking on the dangers of pesticides.

Credit: Charisse S. Yenko

"ERs in areas where farm workers and the urban poor reside are far more overloaded with patients than those located in middle class or wealthier districts."

they might require medical attention. Salinas Emergency Room (ER) nurse Charisse Yenko (*2017a*) notes that the lack of healthcare coverage for these individuals leads to the saturation of ER services since they essentially have no other place to go for medical attention. She points to a clear class-based division in healthcare access, observing that hospital ERs located in areas where farm workers [4] and the urban poor reside are far more overloaded with patients than those located in middle class or wealthier districts where residents are likely to have insurance. Since emergency care is 'reactive,' meaning that it attends to medical problems once they have occurred, the uninsured lack access to *preventive* healthcare, other than through charitable free clinics, or through private clinics and physicians whose fees may be unaffordable for this segment of the population. In terms of sanitation, Yenko observes that the inadequate and overcrowded conditions in which farm workers often live, regardless of whether they are Americans, immigrants or other marginalised populations, make it challenging to maintain high levels of sanitation in and around people's living spaces. Concerning nutrition, she notes that workers' low salaries and the high cost of nutritious food may lead families to buy less expensive processed foods of low nutritional value, since higher quality food is unaffordable to them. Naturally, this type of diet increases the risk of diseases such as diabetes, heart disease, high blood pressure and obesity, among others (*NAM, 1991*). The ensuing section provides a brief overview of health related issues and activities in which RCE BMU's collaborators and their associates are involved.

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[1] A large portion of the population is Hispanic (of Mexican origin to a large extent) with lower education attainment than groups in other areas of the U.S. Rapid industrialisation in México has created scarcity of water and other resources, poverty is generalised across the border. Some of the diseases present across the border are tuberculosis, HIV, respiratory illnesses due to poor quality of air, environmental health, lack or limited health education/access to information, and population growth due to internal migration looking for job opportunities (*Torres, 14 August 2017*).

[2] The primary public assistance programmes for healthcare are Medicare and Medicaid. *Medicare* is a US government programme of hospitalisation insurance and voluntary medical insurance for individuals aged 65 and older. Certain individuals under 65 may also qualify for Medicare if they have a certified disability. Medicaid is a health assistance programme financed by federal, state and local taxes to help pay hospital and medical costs for the low income individuals who qualify for assistance.

[3] The *Patient Protection and Affordable Care Act* (Obamacare-ACA) of 2010 had reduced the number of uninsured Americans from an estimated 46 million to 24 million by 2016 (*NAM, 2016*) by obligating insurers to accept all applicants and to charge the same rates regardless of pre-existing conditions or sex of the applicant. Added to this, the estimated 11.4 million unauthorised immigrants in the USA (*Pew Research Centre, Retrieved 2 August 2017*), and the total population of uninsured individuals can be safely estimated at 35.4 million people. At the time of writing, the Trump administration has made three failed attempts to repeal Obamacare, with the latest proposal voted down on 26 July 2017. Democratic Senator Bernie Sanders of Vermont is expected to spearhead the passage of a single payer bill that would expand Medicare in order to make it available for all. The passing of such legislation would implicitly recognise healthcare as a basic right for the first time in the history of the United States of America.

[4] Hoping to inform the public about what is behind the food supply, Ibarra (*2017*) writes that American and immigrant farm workers often live in overcrowded migrant labour camps which must be vacated during the off season. This leads to a lack of housing and to unsteady education for the children of labourers. Other difficulties include low wages and health problems due to harsh working conditions and to pesticide poisoning (i.e. with chlorpyrifos). Eighty percent of female farmworkers report having experienced sexual harassment. Additional challenges faced by those who are undocumented include the constant fear of deportation, as well as discrimination and violence on the part of landowners and the public at large (*Retrieved 31 July 2017*).

Collaborators' Activities Geared to Improving Health, Sanitation and Nutrition among Vulnerable Populations in the México-US Border Region: Positive results and major challenges

The Alliance of Border Collaboratives (*ABC www.abc-ep. org*) links multi-sectoral actors to offer programmes designed to improve the quality of life of underserved populations on both sides of the US-México border. ABC partners with like-minded organisations ranging from health departments, research organisations, academic institutions, health and human service organisations, networks and coalitions to build community capacity in areas related to health, quality of life and a culture of legality. The Alliance of Border Collaboratives is a primary centre for multi-stakeholder networking in the region. Its on-the-ground collaborative learning approach promotes empowerment and societal transformation on both sides of the El Paso-Ciudad Juárez border. *Promovisión* is a health literacy project funded by the National Institutes of Health's National Library of Medicine. The programme's goal is to promote health literacy with individuals suffering from diabetes, HIV infection and other chronic diseases. *Promovisión* provides nutritional guidelines and teaches individuals about the importance of adhering to the medication regime prescribed by their doctors. The education and awareness brought to vulnerable populations through the programme have profound positive impacts on the health, the quality of life, and the nutrition of the chronically ill and their families. The PaKeTeCuides Programme (So that you will take care of yourself) promotes a culture of lawfulness with students, teachers and parents at elementary schools located in high crime areas in Ciudad Juárez, Chihuahua. It offers social competence training for 5th and 6th graders in order to mitigate crime and to promote a culture of legality. Student participants are trained to multiply the value of respect for the law with members of their peer network at school, at home, and in their community. PaKeTeCuides is helping change people's perceptions, knowledge, attitudes and behaviours toward a culture of lawfulness (*Ramos per. comm.*). Furthermore, ABC's training programmes instil constructive civic values while increasing citizen participation in the community. They equip people with communication and leadership skills, which will aid individuals and their communities throughout their lifetimes.

Eva Moya, PhD is Associate Dean of the College of Health Sciences, Department of Social Work, University of Texas at El Paso. In collaboration with her graduate students and the Opportunity Centre for the Homeless (OCH), Moya and her team work with OCH residents to see and hear directly from them how they experience life on the streets in El Paso, Texas. To do so, they have collected 'visual essays'– through photography, which they couple with the stories that each participant tells about their experience of being homeless. The visual and narrative data collected is utilised to identify common challenges facing the homeless, and to provide recommendations to policymakers and authorities who can help seek solutions to the multiple, complex and interrelated problems faced by individuals and families who find themselves living on the streets. Major challenges uncovered by the project include the 'broken system,' which does not adequately attend to the needs of the poor in society; and 'invisibility,' homeless people repeatedly comment that they are ignored, not seen and avoided by their fellow citizens and people as they go about their daily routines. This stigmatised response to their mere presence has profound psychosocial implications for people struggling to reintegrate fully into society. In order to move out of the situation of homelessness, people often need support in identifying opportunities, and in making constructive decisions about their future. At the level of sociological analysis, Moya and her team found the recurring themes of social stigma, discrimination, broken systems and resilience. They have provided the resulting policy recommendations to local authorities who, we hope, will take concrete actions to better address the plight of the homeless. Helping people move off the streets into adequate housing and employment has profound health, sanitation and nutritional implications for the projects' homeless participants and for society at large. Moya's work with the homeless links researchers,

Harvest time at ALBA Farmers.

Credit: Charisse S. Yenko

civil society actor OCH, and homeless individuals with decision makers by providing policy recommendations to local authorities that are designed to address the needs of the homeless. To end with an example of how researchers can impact people's lives, ten of the study's participants now live in single resident units; one has become Assistant Manager of a resource centre, two have completed graduate degrees, and one is a co-author of publications derived from the project (*Moya et al. 2017b*).[5]

Dr. Moya also collaborates in the Nanotechnology-Enabled Water Treatment System Project (*NEWT newt.engineering. asu.edu*)[6], which has profound implications for health and sanitation in the region. NEWT's nanotechnology provides clean water[7] to rural populations in Texas and beyond. It is currently helping to solve water problems in neighbourhoods in the Texas-Chihuahua border region, which lack potable water infrastructure. Some of these settlements also have no power grid to drive traditional electricity-dependent purification systems, making NEWT's low energy consumption particularly valuable. The health and sanitation benefits of this portable, low-cost water treatment technology are enormous. The NEWT project joins communities, academia, technology developers and the private sector with the borderlands project, serving as a pilot for the eventual commercialisation of NEWT Systems, which we believe will play an important role in solving water scarcity and water sanitation problems across the planet.

Dr. Mark Lusk is the Provost's Faculty Fellow-in-Residence at the Department of Social Work, University of Texas at El Paso. On the US side of the border, he works with Las

Credit: Mark Lusk

Prof. Mark Lusk at Casa del Migrante (The Migrants' House) in Ciudad Juárez, Chihuahua México.

Américas Immigrant Advocacy Centre (AIAC), a non-profit organisation that serves the legal needs of low-income immigrants, refugees, victims of crime and families seeking reunification. AIAC staff and lawyers provide legal representation to individuals and families who otherwise could not afford it (*AIAC, Retrieved 7 June 2017*). In Ciudad Juarez, Chihuahua México, Lusk engages with the Diocese of Ciudad Juárez' Casa del Migrante, (CM, the Migrant's House), which attends to the needs of around 300 people per month. The Casa del Migrante offers hospitality, meals, clothing and medical service to men and families who have left their places of origin in search of a better future. Many of these individuals have been deported, are victims of discrimination, mistreatment and all sorts of abuses (*CM, Retrieved 7 June 2017*). Through working with migrants and refugees, Dr. Lusk has uncovered significant cultural and social resources among migrants that mitigate the adverse effects of trauma and hardship by building resilience against mental disorder (*Lusk email interview, 5 July 2017*). Lusk's work helps promote mental health by uncovering resilience strategies of vulnerable individuals on both sides of the border. Lawyers, the Catholic Church, and its civil society-registered Casa del Migrante connect migrants with legal resources and support to meet their material, spiritual and psychosocial needs as they struggle to find their place in the new land where they have arrived. Through his ongoing advocacy for immigrants and refugees, Lusk further works to counter the generalised negative perceptions held by many Americans concerning these immigrant populations.

Registered Nurse Charisse Yenko (*email interview, 7 June 2017*) describes herself as "a privileged participant, an inspired witness and a humble student of the resilient, vibrant, creative local leaders, citizens, workers and families" whose endeavours are described below. These activities and organisations include the agriculture and nutrition work of ALBA Farmers (AF), the health services offered in the Emergency Room at the Salinas Valley Memorial Hospital, the sanitation and safety efforts of the Safe Ag, Safe Schools Programme, and the women's and children's well-being concerns addressed through Dorothy's Place.[8] ALBA helps interested individuals launch organic farming businesses. Their activities include teaching aspirants about legal regulations and organic certification regimes; furthermore, ALBA offers agricultural entrepreneurship training while providing an incubator in which new farmers are able to consolidate their businesses. The intervention of AF allows farm workers

Credit: Charisse S. Yenko

Farming, sharing and learning.

to become independent business owners while, at the same time, attending to the growing demand for organic products for consumer markets in the region and beyond (*AF, Retrieved 30 June 2017*). Economic self-sufficiency and the ownership and production of healthy organic foods are clearly linked with better health and increased well-being for ALBA's participants; the project further benefits community nutrition by making high quality organic food widely available in local markets. In another project, Monterey County, Salinas and Pajaro Valley Unified Schools launched the Safe Ag, Safe Schools (*SASS www. safeagsafeschools.org*) programme when school personnel and students began to display symptoms of pesticide poisoning. The SASS has led to a ban on the use of Monsanto's Roundup and other toxic chemicals on school grounds throughout the district. The removal of these toxic substances has had positive effects on health, well-being and sanitary conditions in the school district, in families, and in the surrounding area (*SASS, Retrieved 30 June 2017*). Dorothy's Place (DP) is a Franciscan organisation that provides meals, shelter, clothing, basic hygiene and social and health services to farm workers and others (*DP,*

Retrieved 1 July 2017). The organisation's motto is 'co-operating out of poverty,' and their work aims to empower people to move forward toward healthy lifestyles, well-being and dignity. The aforementioned activities address a cross-cutting range of issues that can and do improve community health, sanitation and nutrition. Multi-sectoral collaborators range from hospitals, schools, NGOs, farmers, and a women's shelter. Though different, their activities are interlinked and, as such, they each contribute to the overall health, well-being and nutrition of the Salinas community. For example, ALBA's farming and sustainable business training is highly transformative for labourers who go on to become successful entrepreneurs. The healthy organic foods they produce increase nutrition and health for the workers-turned-entrepreneurs, for their families, and for the community at large. These and other activities mentioned above address many of the UN Sustainable Development Goals as expressed in *Agenda 2030* (*Accessed 8 September 2017*).

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[5] Moya works extensively with limited resource first generation Hispanic students, contributing to overall well-being and enhancing the social mobility of these students, and of the population at large. Her home institution, University of Texas at El Paso, holds national recognition for aiding in the social mobility of first generation Hispanic students.
[6] The University of Texas at El Paso team is headed by José Gardea-Torresday. Team members include Eva Moya, Dino Villagrán and Shane Walker. Collaborating institutions are Rice University, Arizona State University and Yale University. The project is funded by the National Science Foundation.
[7] The NEWT system is able to utilise sources like floodwater, seawater, pond water, etc., which it prepares for residential and industrial use.
[8] Dorothy's Place. (*Retrieved 30 June 2017*). http://www.dorothysplace.org/

Links to the United Nations Sustainable Development Goals

The table below provides a summary of how the aforementioned projects address the United Nations Sustainable Development Goals 2016-2030.

Project	Implemented by:	United Nations Sustainable Development Goals	Impacts on Community Health and Well-being
Promovisión – Health Literacy	Alliance of Border Collaboratives and National Library of Medicine	3 - Good health and well-being	Promotes good health and well-being
PaKeTeCuides- Culture of Legality	Alliance of Border Collaboratives	1 - No poverty 8 - Decent work and economic growth 16 - Peace, justice and strong institutions	Mitigate poverty, instil values leading to gainful livelihoods, mitigate neighbourhood crime and criminality in individual, familial and community contexts
Opportunity Centre for the Homeless (OCH)	Dr. Eva Moya *et al*.	1 - No poverty 2 - Zero hunger 3 - Good health and well-being 8 - Decent work 10 - Reduce inequality	Dignify the homeless; provide opportunities for housing and gainful livelihood
Policy Advocacy to Overcome Homelessness	Dr. Eva Moya *et al*.	17- Promote peace, justice and strong institutions	Provide policy implications studies for legislative bodies
Nanotechnology – Enabled Water Treatment System Project	Dr. Eva Moya *et al*.	3 - Good health and well-being 6 - Clean water and sanitation	Sanitation and clean water for rural and marginalised communities
Immigrant Support and Advocacy	Dr. Mark Lusk, Las Américas Immigrant Advocacy Centre, Casa del Migrante – Diocese of Ciudad Juárez	1- No poverty 2 - Zero hunger 3 - Good health and well-being	Attends to the legal, material and psychosocial needs of immigrants and displaced populations
Farmer Education and Enterprise Development	ALBA Farmers – Agriculture and Land-Based Training Association (Yenko)	1 - No poverty 2 - Zero hunger 3 - Good health and well-being 4 - Quality education 5 - Gender equality 8 - Decent work and economic growth 10 - Reduced inequalities 11 - Sustainable cities and communities 12 - Responsible consumption and production 15 - Life on land	Train local and immigrant populations for sustainable organic agriculture and small business enterprise development; provide nutritious food; promote sustainable land usage
Safe Ag, Safe Schools	Monterey County, Salinas and Pajaro Valley Unified Schools *et al.* (Yenko)	3 - Good health and well-being 4 - Quality education 15 - Life on land	Advocate for safe, pesticide and toxin-free schools and communities
Dorothy's Place	Franciscan Workers of Junípero Serra (Yenko)	1 - No poverty 2 - Zero hunger 3 - Good health and well-being 5 - Gender equality – women's empowerment 6 - Clean water and sanitation 8 - Decent work and economic growth 10 - Reduced inequalities	Provide food, shelter, clothing dignity and warmth for men, women and children. Help participants achieve gainful employment and integrate fully into society
Emergency Room Intervention	RN Charisse Yenko	1 - No poverty 2 - Zero hunger 3 - Good health and well-being 5 - Gender equality – women and children	Attend to medical emergencies, to the uninsured, the hungry, immigrant populations … to all without exception
Special Needs Children	RN Charisse Yenko	5 - Gender equality – women and children	Assist special needs children, their mothers and their families
Cross-sectoral linkages, human development, environmental restoration and sustainable usage, sustainable economic development, community service, knowledge production and dissemination, policy studies to encourage lasting structural changes toward sustainable development	Living Lab/Centro de Diálogo y Transformación Inc. – RCE Borderlands México-USA in collaboration with Universidad Autónoma de Chihuahua, México	17 - Partnerships for the goals	Bring together the work of RCE BMU collaborators and others. Provide a gathering space and a channel for stories, technological developments, and policy implication information to reach across societal sectors in order to work across all boundaries for a sustainable and dignified world

Table 1: RCE BMU collaborator projects, their relationship to the Sustainable Development Goals, and their impacts on the communities they serve.

At the time of writing, the Regional Centre of Expertise Borderlands México-USA has only been acknowledged for eight months.[9] As a new RCE, it is seeking the best ways to support communities, academia and policymakers, and to work toward the Sustainable Development Goals.

Below is a proposal for creating a 'Health and Well-being Support Network' designed as a hub to which stakeholders at all levels may turn to for support with health-related issues.

Credit: Charisse S. Yenko

Nutritious, safe and affordable local food.

9   Hosted by Living Lab/Centro de Diálogo y Transformación Inc. (LL/CDT) in Chihuahua, México, Regional Centre of Expertise Borderlands México-USA (RCE BMU) was acknowledged by United Nations University's Institute for the Advanced Study of Sustainability on 8 December 2016. The present segment was written on 9 August 2017. A primary collaborator with LL/CDT-RCE BMU is Universidad Autónoma de Chihuahua, or the Autonomous University of Chihuahua, México.

Health and Well-Being Support Network hosted by RCE Borderlands México-USA

Because of Living Lab/Centro de Diálogo y Transformación's three-pronged approach – working with community, academia and policymakers, RCE Borderlands México-USA is well positioned to promote SDG 17 – Partnerships for the Sustainable Development Goals – by serving as a hub for dynamic and ongoing
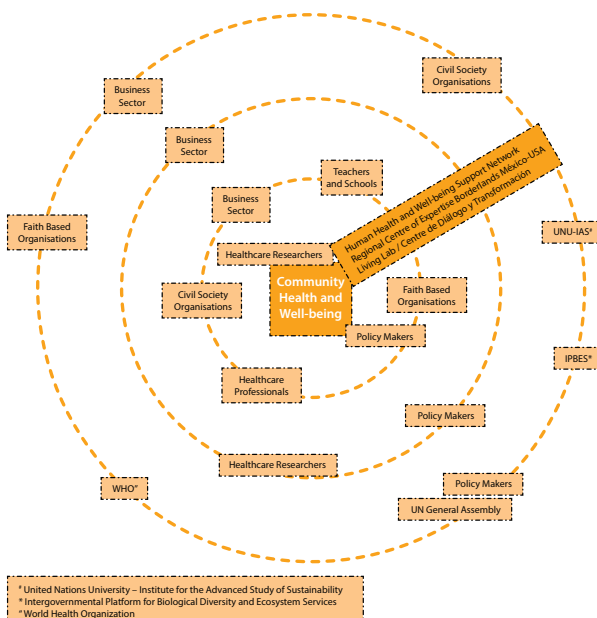

Figure 1: Proposed Health and Well-being Support Network to be hosted by RCE Borderlands México-USA.

partnerships between people on the ground, academics, lawmakers and other stakeholders. Using both its physical and online infrastructures, the aim is to support healthcare professionals, communities and policymakers by offering a 'Health and Well-being Support Network (HWSN) which will link cross-sectoral stakeholders to information, infrastructure, resources and knowledge focused on health and well-being. *Figure 1* above provides a visual summary of how the HWSN is currently conceptualised.

The starting point for the HWSN is the *community*, where individuals, families, healthcare professionals, local government and business entities, civil society and faith-based organisations are found. In *academia*, researchers, universities and repositories for traditional and scientific knowledge make health-related information available *for and from* local, academic and international stakeholders and organisations. Actors in the international milieu include United Nations University-Institute for the Advanced Study of Sustainability, the World Health

Organization, intergovernmental platforms – such as the Intergovernmental Platform on Biological Diversity and Ecosystem Services, the UN General Assembly and others. The HWSN will provide information to academic and international entities pertaining to health and well-being issues on the ground, while simultaneously offering communities and local health professionals access to information from the scientific and the international milieus.

Writers at RCE BMU specialise in Policy Implications studies, for which they collect data from community-level health and well-being projects; they publish and disseminate research findings, and they approach legislative bodies with information designed to inform *policymakers* at the local, the national and the global levels about concerns, interests and situations on the ground in localities in which its researchers work. Data from all LL/CDT-RCE BMU projects is analysed in order to present policy implications studies to municipal, state and sometimes to national authorities with the aim of helping shift the legal regimes at all levels of government toward a paradigm of sustainability and wholeness. Its LL/CDTs have steadfastly worked the policy angle since the inception of its first centre at the beginning of the new millennium. The fact that United Nations University's Institute for the Advanced Study of Sustainability has honoured RCE BMU with the acknowledgement as a Regional Centre of Expertise on Education for Sustainable Development has opened the door so that the concerns of sustainable development actors and the communities they serve may be heard at the global policy level. Irrespective of the level at which authorities are addressed, LL/CDT-RCE-BMU's policy recommendations invariably seek to enhance the dignity and the wholeness of the human community and the natural environment. It is RCE BMU's deepest desire to serve as a channel through which ordinary people's voices can be heard across the planet at the international, the national and the local levels of government and society.

Green Thumb Organics.

Credit: Charisse S. Yenko

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IMPROVEMENT OF HEALTH, HYGIENE AND NUTRITIONAL STATUS OF URBAN SLUM DWELLERS:
A PROGRAMME OF RCE GREATER DHAKA, BANGLADESH

Mohammed Ataur Rahman.

RCE Greater Dhaka comprises the Dhaka megacity and the adjacent low lying, most vulnerable coastal zone, home to a population of more than 50 million. The core organisation of RCE Greater Dhaka is the Centre for Global Environmental Culture (CGEC) at the International University of Business, Agriculture and Technology (IUBAT), Dhaka. Other members of the RCE community are the Institute of Forestry and Environment at the University of Science and Technology Chittagong (USTC); Rotary District 3280, Bangladesh, with the Rotary Club of Greater Dhaka; The Department of Politics and Governance, GonoVishwabidyalaya, Dhaka; The Department of Environmental Engineering, Shahjalal University of Science and Technology (SUST), Sylhet; The Department of Agro-Technology, Khulna University, Khulna; World Wide Opportunities on Organic Farms (WWOOF), Bangladesh; Forestry Environment Plantation Crop and Permaculture Consultancy and Research (FEPPCAR); The Nawab Habibullah Model School and College, SS Enterprise BD, the Red Crescent Youth, Chittagong; and GreenSavers, Dhaka. RCE Greater Dhaka has been working actively with the core objective of mitigating the challenges of climate change extremes and human induced crises for a sustainable Dhaka megacity, and to reduce the sufferings of huge human settlements in and around Dhaka. To mitigate the crises and the unsustainable activities, the stakeholders have collectively organised a network or consortium to promote sustainable activities, undertake research projects, together with awareness and training programmes.

Urban Slums in Dhaka – Health Challenges

Bangladesh is one of the world's most densely populated countries with a population of 165 million in 147,570km² and has 1,116 persons/km² (*Bangladesh at a Glance, 2017; World Population Review, 2017*). The great Ganges-Brahmaputra, Meghna riverine system carves its way through Bangladesh forming a large delta that covers one third of the country's area and is home to 70% of the population. This coastal region is rich with fertile soil and biodiversity but is vulnerable to cyclonic storms, tidal surges, floods and water logging, erosion, salinity intrusion

and pollution. Millions of people are affected every year by the resulting crises such as food shortage, water scarcity, pollution, biodiversity loss, damage to agricultural crops and housing, loss of domestic animals, damage to structures and embankments etc., and thus suffer from famine and malnutrition. These crises are forcing people into abject poverty and migration to the cities, especially to the capital city, Dhaka, and its suburbs for food, shelter, and work opportunities.

The cities are the ultimate shelter during major disasters such as floods, tidal surges, cyclones, tornadoes and famine (*Miyan and Rahman, 2010*); while the urban population has been increasing quickly. Evidence shows an 18-fold increase in the urban population from 1951 to 2011 (*Islam, 2013*), and by 2050 urban dwellers are expected to comprise 50% of the total population (*Howlader, 2011*). The number of households in urban slums has increased concomitantly. Currently there are one million slum households living in 9,000 slum clusters. Population density in the slums is about 200,000/km².

Dhaka is a megacity; its population is projected to rise to 20 million by 2020, and it will become the world's third largest city (*Satu and Ovi, 2009*), with one third of the population living in slums. Because of climate change, air, space, light, water, other logistic support and services to the citizens are becoming increasingly hampered, and the city is becoming uninhabitable. Dhaka has been ranked 139th least liveable among 140 cities (*Economist Intelligence Unit, 2013*). Population pressure and unplanned settlements in the city have seriously affected the well-being of people at work and at home. Research shows that more than 40% of the female workers in factories suffer from chronic diseases such as gastrointestinal, sexually transmitted diseases, reproductive tract infections, menstrual and blood pressure problems, anaemia and family planning related illnesses (*Economist Intelligence Unit, 2013*). It reveals that the major causes of ill health of the huge workforce are single track work under stress and long working periods without any relaxation or amusement, unhealthy living conditions and nutritional deficiency. Most of the workers are underfed, illiterate and

do not have any knowledge about the nutritional value of foods. Poor sanitation and congested living, with four to five people in a 10m² room, leads to infectious diseases such as diarrhoea, dysentery, typhoid, dengue and pneumonia. The lack of proper nutrition and low immunity, result in high child deaths, stillbirth, blindness and physical malformation. (*Economist Intelligence Unit, 2013*).

The proportion of women in the slums of Dhaka using different types of healthcare is much lower than that of the urban population of the country. The current use of Family Planning (FP) is 54% in the slums and 66% in the urban areas of Bangladesh. The use of Ante Natal Care (ANC) is 39.9% in the slums and 45.5% in the urban areas; and the proportion of institutional deliveries, i.e. childbirth in hospitals and clinics, is 39% for slum dwellers and 58% for urban people in the country. On the other hand, access to sanitation in the project area increased from 33% in 2007 to 73% in 2011. In the comparison area, it increased from 59% in 2007 to 68% in 2011 (*Alam et al., 2011*).

Garment workers suffer from poor health and slum children from malnutrition *(RCE Greater Dhaka)*.

Dhaka city is noted for a serious shortage of housing facilities (*Hossain, 2006; Rokanuzzaman et al., 2013*). Willcox (*1979*) showed that due to physiographic features such as low lying agricultural lands and natural barriers such as rivers, canals and depressions, the expansion of the city has been seriously constrained. Lack of proper infrastructure facilities and unplanned urbanisation have created new hazards in informal settlements. The UN Millennium Task Force on slum dwellers reported that the lack of provision of water and sanitation and high levels of overcrowding,

contribute many communicable and non-communicable diseases, injuries and premature deaths in several urban slums in the megacity of Dhaka (*UN Millennium Project, 2005*).

Unhygienic sanitation and miserable conditions in the slums of Dhaka *(RCE Greater Dhaka)*.

A slum along the railway line at Tejgaon *(RCE Greater Dhaka)*.

The lack of adequate education and skills results in most urban migrants working in the informal sector as rickshaw pullers, van and auto drivers, construction workers, daily wage labourers, vendors and street hawkers. A noteworthy occupation especially for women is as workers in garment factories. A significant number of the urban migrants live in slums. Generally, these people consume rice two or three times a day, but rarely consume milk, meat, fruits

and vegetables. Therefore malnutrition, especially among women and children, is a serious problem in Dhaka. Protein-energy malnutrition, anaemia, iodine deficiency disorders, and vitamin A deficiency are common (*UNICEF, 2011*). The World Food Programme (*2004*) estimated that 47% of pregnant women in Bangladesh suffer from anaemia. Malnutrition passes from generation to generation as malnourished mothers give birth to malnourished children, and the underage-five mortality rate is 59 per thousand (*World Bank, 2011*). The inadequate consumption of protein and micronutrients results in various long- and short-term health problems, such as stunting, underweight, osteoporosis and low bone-mass (*Leslie, 1991; UNICEF, 2011; Rahman, 2015*).

Health education campaign and RCE volunteer interviewing slum people (*College of Nursing, IUBAT, RCE Greater Dhaka*).

High inequity exists between the slum dwellers and other residents of Dhaka city in respect of use of healthcare facilities (*Bangladesh Urban Health Survey, 2013; Jahan et al., 2015*). This is partly due to high income inequity. While several factors limit the demand and supply of healthcare; nevertheless, limited access to healthcare is a serious constraint to their use of healthcare. Although the government has a primary healthcare system, organised healthcare facilities are absent in the slums.

Baseline Research

A research study entitled "Benchmarking the Nutritional status in the Tongi-Ashulia Road Slums" was jointly conducted by the College of Heath Sciences and Nursing of IUBAT and Simon Fraser University, and was published in Centre for Policy Research Commentary No. 7 (*Richards et al., 2010*). Results of the study showed that although the urban poor consume sufficient high calorie cereal based food, it lacks adequate quantities from the full range of nutrients of the various food groups. Results also showed that people are habituated to smoking, chewing betel leaves and nuts, and drinking beverages, on which they spend a significant portion of their income. Based on this research, investigation has continued on the improvement of the nutritional status for women in low-income households. According to a publication of CPR (*Shahrin and Richards, 2012*), women face problems of inadequate calorie intake and lack of dietary variety. Many women suffer from deficiency of necessary vitamins and micronutrients that are present in fruits, vegetables and dairy products. While nearly all women in the rural sample use hygienic tube-well water, most urban women use unhygienic tap water.

The project started with a survey to assess the nutritional status of low-income urban slum dwellers. The study was conducted in Abdullapur, Kamarpara, Tongi, Ashulia and Uttara slums, and the survey was restricted to households living in non-pucca[1] houses. A household included all people living together in the same dwelling, sharing assets and income. The surveyors randomly selected the households for interview. A pair of surveyors, a male and a female, went to each household to interview the respondents. The survey consisted of a questionnaire with semi structured or open ended questions. They also conducted focus group discussions. The discussions focused on nutrition, smoking behaviour, income generation initiatives, food habits, hygiene status, availability of fresh drinking water, and their connection to poverty. Data was statistically analysed and the results reviewed from a policy perspective. Specific integrated intervention strategies were developed.

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[1] Temporary and fragile, not made from strong and sturdy materials.

Strategies and Activities to Address Challenges

RCE Greater Dhaka partners started Education for Sustainable Development (ESD) programmes to create awareness on health and related determinants as a voluntary initiative. Community priorities and leaders were identified through community assessments. After preliminary meetings with the community leaders, their support to mobilise community participation was enlisted. A local representative was elected to coordinate the programme activities.

Students of the College of Health Science and Nursing are engaged in the programme in the surrounding Tongi, Ashulia and Uttara areas and are also involved in the Uttara community. Tongi and Ashulia are industrial townships adjacent to the Uttara residential area, and huge slums have grown along the embankment and highways close to the university campus. The programme includes awareness raising, training, developing consciousness about adopting a healthy lifestyle, free immunisation and health check-ups, access to medicines, blood donation, and conducting research on the nutritional status of the slum dwellers.

Project partners organise awareness programmes on a regular basis, which involve the Government's Health and Education departments in these programmes. The RCE also collaborates with NGOs to conduct health awareness programmes in villages and urban slums. General as well as specific health awareness camps that focus on diseases like anaemia, dengue, chikungunya and Malaria, eye, ear, dental problems, HIV/AIDS and H1N1 (Swine Flu) have been organised. Awareness programmes on ante-natal and post-natal healthcare, reproductive health, child health and nutritional status, were also conducted. Child-to-child and child-to-community strategies have been adopted in some places to spread vital health messages. For example, youth have been trained on tuberculosis with the help of the Medical and Health Department, and they in turn are encouraged to spread the message to the community through presentations, special games and play devised for the purpose. Positive Deviance / Hearth approach[2] has been adopted in some places to address malnourishment among children in the 0-5 years age-group. Under this approach, the positive deviants (families with well-nourished children) are identified to understand the unique behaviours that enable them to outperform their neighbours, and this wisdom is shared with the families of malnourished children through well designed nutritional health education programmes. To sensitise pregnant and lactating women on maternal and child health and to reduce women and infant mortality rates,

RCE Greater Dhaka conducts health awareness camps and runs Nutrition Centres at the university campus that provide nutrition supplements and health check-ups. The list of the project partners and their roles is presented in Box 1.

Blood donation and health check-up (*College of Nursing, IUBAT, RCE Greater Dhaka*).

> **Box 1. Main Partners of the Project and Their Roles**
> *The main project partners and their roles are as follows:*
> 1. Centre for Global Environmental Culture (CGEC) is the lead organisation that initiated and is coordinating the programme
> 2. International University of Business Agriculture and Technology is providing the logistic support
> 3. College of Health Science and Nursing of IUBAT is providing health services, training and conducting research on the nutrition status
> 4. Rotary District Greater Dhaka 3280 is supporting the programme financially
> 5. Centre for Policy Research (CPR) is conducting research and helping to bring out publications
> 6. Quantum Foundation is conducting health checkups and blood donation camps
> 7. Sikder Medical College is conducting health checkups and blood donation camps
> 8. Simon Fraser University, Canada, is providing technical and logistical support.

Learning from Experience

The services offered are now part of a regular programme, since the slum dwellers that have been participating in the health camps have benefitted from them. Coordination among the partners has been a major factor for successfully achieving this goal. CGEC has been organising and keeping on schedule the activities, namely training and health campaigns, health check-ups, blood donation, and observing an immunisation day. It has built a close relation between the university, the slum dwellers and Uttara communities. The Coordinator of the College of Nursing of IUBAT has been monitoring the programme.

The project has contributed to learning and knowledge generation about sustainable and healthy lifestyles, malnutrition in relation to poverty, and healthy life for the urban poor. It has also contributed to the identification of the root of the problem and working collectively, while keeping in mind humanity, leadership and coordination. Indeed, the whole programme is based on an ethical, humanitarian perspective and approach, given around three million urban people in Dhaka have been suffering due to critical issues of poverty, malnutrition and unhygienic conditions, while the rich and so called civil society, government and political organisations have ignored these very important issues of a large section of the city dwellers.

The RCE volunteers did not face any significant barriers during their work in the slums. The volunteers' approach was friendly, and the slum dwellers gladly cooperated by providing information, receiving training and practicing lessons about hygiene and nutrition for a healthy and sustainable life. Finance, although an important issue, was not a constraint as IUBAT, Rotary District Greater Dhaka, and Simon Fraser University have been funding the programme, and Quantum Foundation and Sikder Medical College have been supporting it with medical and healthcare services.

This programme has motivated the Uttara community and the slum dwellers to take proper care of their health, hygiene and nutrition. The programme is widely publicised through research monographs, print and electronic media, with partner organisations, and has thus also influenced other urban communities nationwide.

The programme is progressing through voluntary collaboration with partner organisations for awareness, training and campaigns. It has been attracting hundreds of volunteers from the country and abroad. Volunteer nurses from Canada, USA, Australia, UK, Netherlands and Japan, and the students of the College of Health Science and Nursing have been visiting the slums, doing research and practicum, gathering data and experiences, training the urban poor, thus enriching the health standard of the illiterate urban people, especially of women and children. The programme has also been extended in the rural area of Jamalpur District (*Shahrin and Richards, 2012*).

> The project has been a great opportunity to reflect on the responsibility and relevance of the involvement of academic institutions with the community.

With the intervention of RCE Greater Dhaka, awareness has been built up in many organisations, including the Government departments, NGOs, private organisations and donor agencies, about the conditions in slums. This awareness has, to some extent, led to more work on improving the conditions. In recent years the World Bank, for example, has taken on the project, "Bangladesh Poverty Diagnostics for Water Supply, Sanitation and Hygiene" (*World Bank, 2016*).

A lot, however, remains to be done. Effective measures are needed to increase both demand and supply of services, thereby leading to integrated development. The project has been a great opportunity to reflect on the responsibility and relevance of the involvement of academic institutions with the community. This was especially a good chance for students and volunteers to experience the life among the low-income slum population, including their lifestyle, food habits, sanitary conditions and the health status especially of women and children. The positive behavioural changes observed in the community from the beginning were quite motivational and led to more large scale projects. They prompted the government and other NGOs to initiate such integrated programmes on health, hygiene and nutrition not only in urban slums but also in rural areas.

RCE Greater Dhaka encouraged other partners to join in the health and nutrition projects, and the area of study has been expanded due to the emergence of serious concern about the widespread outbreak of dengue, chikungunya, Malaria (mosquito borne viral diseases) and HIV, especially in the slums. Another important issue of concern is the large scale increase in caesarean deliveries. As pollutants

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[2] Positive deviance/Hearth is a community-based approach for behaviour change by promoting positive practices of households of the same socio-economic status among the wider community. Initiated in the 1970s, the programme has been widely promoted by several NGOs across countries among communities, especially among mothers of preschool children, for improving nutritional and health practices.

have a great effect on pregnancy, it has become necessary to find out if there is any link between the high rate of caesarean operations and these wider determinants. A sample study and an awareness campaign are now being conducted in this area. The programme is also assisting women in taking preventive and curative measures relating to various gynaecological conditions. This programme has been running effectively since 1 January 2014 under a hitherto defunct programme of the Amina-Muhammed Ali Foundation.

Conclusion

Health, hygiene and nutrition are an integral part of people's day-to-day lives. Without sufficient knowledge about these, many suffer from malnutrition and different infectious and non-infectious diseases, which cause early deaths, abnormalities in reproductive health and pregnancy. The fact that about 30% of the urban population lives in slums in the developing countries without access to the required health, hygiene and sanitation facilities is significant. It is therefore essential to learn about the lifestyle of the slum dwellers and the poor, to bring the activities of the project under the ESD programme and to help fulfil the Sustainable Development Goals (especially SDGs 3 and 4). The need for community involvement to ensure well-being of the poor in terms of improvement of nutritional status and gender equity, and the need to provide knowledge about sustainability are the important learning outcomes of this programme.

RCE Greater Dhaka has been working as the frontrunner of meaningful ESD in Bangladesh. The success of the project is a result of the involvement of other stakeholders. To implement the SDGs, it is essential to ensure wide-scale involvement of the communities for the overall improvement of health, hygiene and nutritional status for a better life. The programme Improvement of Health, Hygiene and Nutritional Status of Urban Slum Dwellers, undertaken by the RCE has also been supporting the Global Action Programme (GAP) to integrate ESD into international and national policies in education and sustainable development. An enabling policy environment is crucial for mobilising education and learning for sustainable development and scaling up ESD action. The project supports the call to strengthen and continuously build the capacity of educators, trainers and other change agents for ESD.

Empowering and mobilising youth is a priority area of GAP as they have a high stake in shaping a better future for themselves and for the generations to come. The project does so by supporting both students and youth volunteers in their role as change agents, especially in the areas of health, sanitation and nutrition education, action and research. The ESD approach of this project aims to ensure

that all concerned understand the health problems of vulnerable groups. This includes how gender inequalities may affect health and well-being, learning about direct strategies to be included in the ESD programme. These strategies focus on promoting health and well-being, through for example, vaccines, healthy food, physical activity, mental health, medical consultation, education, sexual and reproductive health education, including education on pregnancy and safer sex. Indirect ways of learning to promote health and well-being, can be in the form of political programmes for health insurances, affordable prices of medicine, health services including sexual and reproductive healthcare services, drug use prevention, transfer of knowledge and technology, reduction of pollution and contamination, and early warning of disasters and overall disaster risk reduction.

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BIODIVERSITY AND CONSERVATION OF INDONESIAN MEDICINAL PLANTS:
SUSTAINABLE USE AND STANDARDISATION

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Summary

The aim of this programme was to promote human and environmental health through sustainable consumption and production of standardised herbal medicine. This programme was funded mainly by Indonesia – Managing Higher Education for Relevance and Efficiency (I-MHERE) as a project in collaboration with the local government; Agriculture Training, Research and Development Station (ATRDS/KP4) Universitas Gadjah Mada (UGM) now called Pusat Inovasi AgroTeknologi/PIAT (Centre of AgroTechnology Innovation) as a member of RCE Yogyakarta; the National Centre for Research and Development of Medicinal Plant and Traditional Medicine (Balai Besar Penelitian dan Pengembangan Tanaman Obat dan Obat Tradisional /BP2TOOT), and the pharmaceutical industry.

The programme started in 2010 with the following objectives:

- Establish an inventory and database system of local properties such as regional mapping of medicinal plants and ethno-pharmacological uses of herbal medicines
- Research on herbal medicine and its dissemination
- Dissemination of Good Agriculture and Collection Practices (GACP) in herbal medicine cultivation
- Establishing of a "demplot" (demonstration plot) for cultivation of medicinal plants and standardisation of herbal raw material production
- Partnership with pharmaceutical industries
- Exhibition of herbal medicines and cosmetic products

The programme targeted students, community, farmers, small and medium enterprises on traditional medicine, and researchers. The main learning objectives were to increase their knowledge, help them to understand the principles of sustainable development in the field of herbal medicine, and learn how to apply the techniques of GACP and management of herbal medicines. The project also aimed to promote health through sustainable management and production of medicinal herbal materials.

The programme used various approaches depending on the objectives of each part of the programme and its audience. The development of the inventory and database system was done mainly by students, as part of their undergraduate thesis. It involved literature surveys and interviews with local healers and herbal consumers. The information obtained was combined with the findings of research conducted by lecturers of UGM, and was uploaded on the web for public access. The more common approaches of disseminating research were workshops, trainings, seminars and conferences.

The unique approach of this programme was that the community was involved as partners. From the beginning they were informed about the importance of producing standardised and approved medicinal herbal materials, how they could explore and identify medicinal plants in their local natural environment, how they could cultivate them, and how they could benefit from the programme

Developing demplots for practicing good agriculture and collection practices among the farmers to increase the quality of herbal medicine raw materials; Phyllanthus urinaria (Faculty of Pharmacy and Faculty of Agriculture, Universitas Gadjah Mada – RCE Yogyakarta).

Developing demplots for practicing good agriculture and collection practices among the farmers to increase the quality of herbal medicine raw materials; Androgrphis paniculata (Faculty of Pharmacy and Faculty of Agriculture, Universitas Gadjah Mada, RCE Yogyakarta)

in terms of economy, environment and health. The community learned and observed the differences in the herbal materials produced, when they applied GACP during the cultivation. By involving the community in designing the programme and determining the appropriate methods of running it, sustainability was more likely achieved. This programme could not have succeeded without the involvement of community leaders who actively encouraged their community to have the commitment to do better. Finding those community leaders, however, was a major challenge.

The programme was beneficial for the community in that they had more access to information on herbal medicine, learned about self-medication using herbal medicine, and that now they are capable of producing quality herbal medicine materials cheaper than before. The researchers had more opportunities to develop standardised herbal medicine/phytopharmaca. The students benefitted from this programme adding field experience to their studies. Small and medium enterprises also benefitted as the programme increased their access to quality herbal medicine raw materials.

Background

Indonesia is a country rich in biodiversity, and is one of the top three mega-biodiversity centres of the world (*Butler, 2016*). In recent years, the global market has witnessed a high demand for natural medicine, and the market for supplements and herbal medicine is estimated to reach US$107 billion by 2017 (*Nutraceuticals World, 2012*). Some factors that have influenced the growth of the herbal medicine market are the assumption that herbal medicines have no or minimal side effects, cultural practices and traditions, lifestyle changes and consumers' willingness to go back to nature, as well as the innovation in herbal medicine formulations (*Joshi and Shankar, 2016*). Indonesia, with its rich biological heritage and cultural background, plays a key role in the herbal medicine industry. As in most other countries of the world, herbal medicines have gained a wide recognition within Indonesia in recent years, and the turnover of this industry in the country is expected to reach $800 million per year by 2017. Its export value in 2013 was $23.44 million, which too will increase (*Global Indonesian Voices, 2015; Ministry of Trade, 2014*).

In contrast to these favourable conditions, the development of herbal medicines lacks optimisation. Of the 38,000 species of plants, only 2,039 have so far been listed as medicinal plants, with relatively complete basic information (*Zuhud, 2009*), and much fewer are being used commercially as traditional medicine or being researched scientifically for their medicinal properties. A systematic inventory or knowledge about the rich diversity of medicinal plants and their traditional usage in various parts of the country does not exist, and there is a lack of conservation and cultivation of herbal plants.

The Government classifies herbal medicine into three categories – Jamu, standardised herbal medicines and phytopharmaca. Based on data released by Badan POM (the National Agency of Drug and Food Control), only 45 are proved to be standardised herbal medicines and eight products are phytopharmaca[1]. These conditions do not support the high demand for herbal medicines which are relatively more affordable.

Traditionally, in Indonesia, herbal medicines are used based on empirical data for maintaining health, beauty and fitness in the form of Jamu, Indonesian traditional medicine. Jamu can be prepared by individuals themselves, obtained from sellers (called Jamu Gendong), through the local market or ready-made from the manufacturers. It is also used by local healers to treat diseases. Although the use of herbal medicine in clinics has experienced its ups and downs, the government has paid attention to the development of herbal medicine and put phyto-pharmaceutical research and development on

Training on appropriate use of medicinal plants for maintaining health, good harvesting techniques and diversification of herbal products (Faculty of Pharmacy Universitas Gadjah Mada – RCE Yogyakarta).

the National Research Agenda. Following the declaration of Jamu as an Indonesian brand in 2008, the Ministry for Health, in January 2010, announced the launch of the so-called "Jamu scientific programme" with the intention of developing Jamu into scientifically proven products, based on pre-clinic and clinical studies. The former Indonesian president, Susilo Bambang Yudoyono, supported this development by visiting "Balai Besar Penelitian dan Pengembangan Tanaman Obat dan Obat Tradisional" (National Centre for Research and Development of Medicinal Plants and Traditional Medicines) in Tawangmangu, established in July 2006, and encouraged its development as a clinic for traditional medicine.

Based on the demand for Jamu, its market growth and the growth of the Jamu industry, all stakeholders including the government, and the private and academic sectors decided to collaborate to develop Jamu in Indonesia, prioritising the aspects of quality and safety. The government releases regulations on business permits and registrations to protect consumers, as well as regulations for the centres of development and application of traditional healing (*Purwaningsih, 2013*). The government also educates local healers (namely BATTRA) and physicians and certifies them. In terms of research, Jamu experts involved professionals and academics to create an organisation called Himpunan Ahli Bahan Alami Indonesia (HIPBOA), later changed to Perhimpunan Peneliti Bahan Alam (PERHIPBA) Indonesia in 1980 (*Indonesian Natural Materials Researchers Association, 2005*), which focuses on research and dissemination of the advancement of herbal medicine development. Research on herbal medicine is also conducted in universities and other institutions.

So far the limited evidence of herbal medicine used in therapy hinders its application in clinics. In line with the mission to develop traditional medicine to make it accepted in clinics and the global market, the Faculty of Pharmacy UGM has set up a centre of excellence on herbal medicine and supplement development. One of the projects undertaken by the Centre is "Biodiversity and Conservation of Indonesian Medicinal Plants: Sustainable Use and Standardisation". This project was about the documentation of local herbal medicines, the development of an inventory and a data base, improving cultivation, disseminating scientifically proven herbal medicines, and optimising the development of Indonesian herbal medicine to be scientifically proven and accepted in clinical applications. It prioritised the development of standardised herbal medicines[2] and their sustainable production.

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[1] Phytopharmaca herbal medicine that has run through clinical studies and its active compound is known. Standardised herbal medicine, on the other hand, has not yet been through clinical studies nor has its active compound been characterised so far, but it has passed certain parameters of standardisation set up by the Ministry of Health.
[2] Standardised herbal medicine is a term used by the Indonesian Ministry of Health. It is different from "certified herbal medicine" in regard to the agency which set up the parameters and also gave the certification.

Main Partners and Their Roles

In running the programme, the Faculty of Pharmacy UGM collaborated with stakeholders including students, the community, PIAT UGM (Centre for AgroTechnology Innovation UGM), farmers, BP2TOOT (National Centre for Research and Development of Medicinal Plant and Traditional Medicine) and the pharmaceutical industry. Students were involved in documentation and establishment of the inventory and a local database on herbal medicine (within the region of Yogyakarta) and their potential uses. The students interviewed local healers and the community on the use of herbal medicine, did laboratory work as well as literature studies. Their study formed part of their final year thesis. This was a learning experience for the students and at the same time educated the local healers on the proper preparation of herbal medicines, and the importance of safety in using Jamu.

PIAT UGM as the centre for AgroTechnology Innovation provides a learning space for farmers in proper techniques for the cultivation of medicinal plants. This centre together with farmers establishes cultivation strategies and applies Good Agriculture and Collection Practices to obtain qualified herbal medicine raw materials which meet the requirement of parameters set up by the Ministry of Health. The learning for farmers has been that adopting the GACP not only increases the economic value of herbal medicine, but also fulfils the requirements of the herbal medicine industry. Additionally it leads to more income for the farmers, while at the same time maintains the biodiversity of medicinal plants. Some "demplots" (demonstration plots) of medicinal plants have been developed at this centre.

The National Centre for Research and Development of Medicinal Plants and Traditional Medicine and Apotek UGM in this programme function as partners for learning, benchmarking, and practising the appropriate use of herbal materials for medication and maintaining health. This programme also partners with the pharmaceutical industry in research and development of medicinal plants as sources of standardised herbal medicines as well as for product marketing. The collaboration continues to date.

Contribution of the Project

The innovative aspect of this project was that it attempted to scientifically validate, improve and promote the traditional knowledge of the community about herbal medicine for the health and economic benefit of the community and the conservation of the local biodiversity. The development of a herbal medicine inventory and database as well as cultivation strategies were developed, based on the traditional knowledge of the local people. This was then supported by the study

of scientific literature. The scientific validity of empirical benefits of traditionally used herbal medicines was tested through laboratory work and research conducted by students and researchers within the university, followed by dissemination of the findings and knowledge to the farmers and the community. The communities were encouraged to use what was available in their environment for healthcare and at the same time to cultivate the medicinal plants in ways to ensure the required quality and to prevent their extinction. The engagement process involved training, benchmarking and action programmes through development of herbal garden demplots.

This project has benefited the community by helping develop sustainable livelihoods based on GACP in the production of herbal medicine plants and the supply of quality raw materials to the herbal medicine industry. The community also benefited from access to the more affordable herbal medicine in their own areas whose function and value they now understood and appreciated better.

The unique longterm sustainability element of this project was the existence in the local culture of traditional medicine that uses locally growing herbs and plants for healthcare. Another key element was the identification and involvement of community leaders who were committed to improving the life of the community. Ideas, commitment and practices that came from the community itself were easier to build upon and integrate within the lifestyles than if something alien had to be imposed upon them. The community being partners rather than the object of the project was an innovative way to encourage sustainability and life-long learning. Continued guidance from the experts is important to prevent abuse of herbal medicines and guarantee continued supply.

The critical governance element that made this project successful was that it had been designed to integrate the three university functions, namely, education, research and community service. It is in line with the mission of the Faculty of Pharmacy UGM as one of the members of RCE Yogyakarta to develop a centre of excellence in herbal medicine and supplements, so that the programme has the continued support of the university in terms of funding. The implementation itself also integrated the Student Community Services-Community Empowerment Learning (SEC-CEL) Programme, which is run continuously to support the sustainability of the programme. This programme was also implemented as part of the education process in that the research is designed as part of the final year student thesis.

Indeed there is an economic dilemma among the community as they want to sell their products not just to

Training on appropriate use of medicinal plants for maintaining health, good harvesting techniques and diversification of herbal products (Faculty of Pharmacy Universitas Gadjah Mada – RCE Yogyakarta).

meet their needs but to also increase their income. Indeed, it is a challenge in that pharmaceutical manufacturers expect continuous production of qualified materials so that they get certain amounts of supplies at certain times, which is sometimes difficult for the producers to achieve. To address this issue, they have been encouraged to develop their own small and medium enterprises in herbal medicine to increase their income.

The major institutional barrier that the university has to face is how to function as facilitator both for the community and the industry. This issue is addressed by dissemination of herbal medicine research to the community to increase their knowledge on the value of herbal medicines and to the industry as partners for the development of standardised herbal medicines.

Upscaling of the Project

In order to maintain and sustain community knowledge on the importance of quality and safety of herbal medicines, the cultural tradition of using Jamu, and the supply of herbal materials to the industry, some actions could be taken to increase the scope, scale or impact. The actions include; 1) making this programme a routine programme

of the university in promoting human and environmental health through sustainable production and consumption of herbal medicine; 2) expanding the area of development: The programme was initiated on PIAT UGM campus and its surrounding area in Brebah Sleman district but it has now been extended to Hargotirto village in Kulonprogo and Mangunan village in Imogiri Bantul; and 3) continued collaboration and synergy with the local government, pharmaceutical industry, National Centre for Research and Development of Medicinal Plants and Traditional Medicines, and Apotek UGM.

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HERBS FOR HEALTH: COMMUNICATING FOR CONSERVATION, CULTIVATION AND SUSTAINABLE UTILISATION OF MEDICINAL AND AROMATIC PLANTS

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RCE Srinagar works in the Indian Himalayan Region (IHR), the northern-most part of India, including the areas on the international border of India with Pakistan, China, Nepal, Bhutan, Myanmar and Bangdalesh. Most of this region is politically sensitive, especially the areas on the Line of Control (LoC)[1] with Pakistan where RCE Srinagar is located. It is heavily guarded by armed forces, and movement in the area is restricted, controlled and monitored. CEE Himalaya, the Himalayan regional office of the Centre for Environment Education (CEE), is the secretariat of RCE Srinagar. The RCE network consists of more than 20 institutions including two universities, colleges, several government departments including the Department of Education, the Municipal Corporation, NGOs and CBOs.

Exposure visit of Biodiversity Management Committee to MPCA.

The IHR is a rich repository of biodiversity, minerals, ecosystem services, traditional wisdom, intangible cultural heritage, indegenous people and their practices. Ecologically the Himalayan region is very fragile, susceptible to climate change and environmental degradation. Human health in IHR has always been an important issue. As in most parts of rural India, in IHR too the most accessible healthcare is provided by local healers. They obtain their supply of medicinal and aromatic plants (MAPs) that they need for their treatments, from the wild, and some also through cultivation. Rapid deforestation and the loss of MAPs diversity has been threatening the

availability of MAPs and, in turn, adversely affecting the traditional rural healthcare systems.

Education for Sustainable Development (ESD) offers hope of halting the pace of deterioration and loss of the rich and unique biodiversity of the region, of restoring some of what has been lost, and promoting sustainability. RCE Srinagar, with CEE Himalaya, the State Medicinal Plant Boards, State Biodiversity Boards, State Forest Departments in the States of IHR and the Foundation for Revitalization of Local Health Traditions (FRLHT), Bangalore (now a deemed university, the Trans Disciplinary University, TDU *http://www.frlht.org*) collaborated to highlight the need for conservation and cultivation of MAPs. Together they developed a communication strategy and a variety of Information, Education and Communication (IEC) knowledge products and tools that have been disseminated and used for the purpose.

Nursery of MAPs in a MPCA.

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[1] See What is the Line of Control? *https://blogs.wsj.com/briefly/2016/09/30/what-is-the-line-of-control-the-short-answer/*

Initiatives to Protect Biodiversity of the Region

Uttarakhand, a state in Central Himalaya, has been declared a 'Herbal' State by the State Government. This is due to its unique biodiversity, rich forest cover, strong presence of a knowledge network of individuals and institutions, both governmental and non-governmental, environmental crusaders and activists, as well as a strong industry based on herbal products and a market for herbs and herbal products. The state is also home to several rare and endangered species of MAPs that are extensively used by the pharmaceutical industry, both domestic and international, for the preparation of several drugs. The natural populations of such medicinal plants are exposed to various degrees of threats, which have been increasing over time (*Mulliken and Crofton, 2008*).

There are 7,835 licensed manufacturers (small, medium and large together) of Ayurvedic medicines and 1,209 manufacturers of Unani, Siddha and Homoeopathic medicines which are highly dependent on natural resources (*Government of India, 2015*). For instance, the 'Indian Medicines Pharmaceutical Corporation Limited' (IMPCL) at Mohan, Uttarakhand, a Government of India enterprise under the administrative control of the Department of AYUSH, Ministry of Health and Family Welfare (*www.impclmohan.nic.in*) manufactures Ayurvedic and Unani medicines to supply them to the Central Government Hospitals and Central Government Research Units all over India. IMPCL was set up to meet the Ayurvedic and Unani medicines demand of the Central Government-run healthcare units and also some State Government-related departments of the country. IMPCL requires a huge quantity of raw material of a large number of MAPs and, therefore, purchases it from vendors in Delhi. It does not make any local procurement which is to ease the official purchase process and to get all the items from a single source. The MAPs vendors in Uttarakhand get much of their supply from Nepal as the availability on the Indian side is very little.

MPCA Mohan, Uttarakhand. Photo CEE.

The high diversity of MAPs in Uttarakhand holds immense potential for enhancing livelihoods through their harvest and cultivation. Various initiatives by the State seek to promote and mainstream the sustainable use of these high-value MAPs resources. The initiatives included:

- Development of a comprehensive conservation, development and harvesting (CDH) plan for MAPs
- Establishment of the State Medicinal Plant Board (SMPB)
- Demarcation of more than 10,200 hectares of reserve forests as Medicinal Plant Conservation Areas (MPCAs) and Medicinal Plant Development Areas (MPDAs)
- Establishment of four Herbal Gardens, and six more proposed
- Germplasm of 224 species of MAPs collected
- In situ populations of extremely rare and endangered species discovered and their proliferation programmes initiated
- Several nurseries, at least one in each MPCA/MPDA, established for ex-situ conservation

A number of initiatives (*see box above*) have been launched by NGOs and other institutions in the fields of research, inventory and documentation, and for establishing cultivation protocols for sustainable use of MAPs to strengthen livelihoods. One such national-level intervention was a Global Environment Facility (GEF)-supported Government of India (GoI)–United Nations Development Programme (UNDP) initiative on "Mainstreaming Conservation and Sustainable Use of Medicinal Plant Diversity in Three Indian States." This project was implemented on a pilot basis in three states, namely, Arunachal Pradesh, Chhattisgarh and Uttarakhand, with the goal of conserving India's medicinal plant diversity. The project aimed at mainstreaming the conservation and sustainable use of medicinal plants into the productive forest sector in the selected states (*Government of India and GEF-UNDP, 2015*).

Bringing Awareness to Key Stakeholders – Motivation Behind the Initiative

The success of any government or scientific initiative depends on community participation, which in turn is determined by how effectively the goals, objectives, provisions and people's roles are communicated to the stakeholders. The present case study is based on the project of developing a communication strategy and tools for the diverse stakeholders involved in the above mentioned GEF-GoI-UNDP project in the state of

Uttarakhand. Initiated with the objective to establish and sustain a communication process that leads to a change in the mindset and behaviour of stakeholders, the intervention had a larger aim of mainstreaming conservation of MAPs in their natural habitat, their scientific and sustainable harvesting, and their cultivation as an alternate livelihood option.

The core approach for conservation vis-à-vis sustainable consumption in this project was through natural forest sites with viable populations of 'Globally Significant Medicinal Plants' (GSMPs) designated as 'Medicinal Plants Conservation Areas' (MPCAs) for in-situ conservation and demonstration. The MPCA model was pioneered by FRLHT. Today, India has a network of 112 MPCAs (*Payyappallimana and Subramanian, 2012*), of which seven are in Uttarakhand. MPCAs in Uttarakhand have been designated to conserve the biodiversity specifically of MAPs, at different altitudes and in varying geo-agro-climatic conditions.

The bottleneck in making the project a success, however, was that people in the state were not aware of their rich heritage of GSMPs and the potential of MAPs as a livelihood option. Long-lived traditional herbal healing practices were dwindling due to limited access to forests, ever decreasing population of herbs in the wild and, most significantly, the lack of knowledge transfer to the younger generations. The people of the land of herbs had gradually shifted to the conventional system of Western medicine and other health services while the illegal exploitation of medicinal plants continued from the wild, benefitting a few affluent traders. A need was felt to have a strong communication strategy and effective communication tools to familiarise stakeholders with the concepts of conservation, sustainability, scientific harvesting of MAPs and the livelihood potential from cultivating MAPs.

RCE Srinagar Interventions

The RCE Srinagar team, with CEE as the facilitating partner, took the lead in developing a communication strategy and tools and delivering them to various stakeholders, namely, the officials of the State Forest Department; members of the State Medicinal Plants Board; Local Management Groups for MAPs; Van Panchayats (Village Forest Councils); farmers and MAPs cultivators; collectors, middlemen and traders; the pharmaceutical industry; corporates involved in the trade of MAPs; traditional healers, herbal health practitioners, Ayurveda practitioners; schools and colleges; and local NGOs and CBOs.

Appropriate messages were developed around many topics, ranging from appreciation of biodiversity of the medicinal plants to the livelihood strategies that would help to sustain this biodiversity (*see box below*). The messages were communicated using a number of knowledge products and delivery mechanisms.

Subjects of the Communication Strategy
- Uttarakhand: A Herbal State – recognise your natural heritage
- Medicinal Plants Conservation Areas (MPCAs)
- Globally Significant Medicinal Plants (GSMPs) of the state
- MAPs for improving livelihoods and scope for cultivation
- Sustainable harvesting practices for available MAPs
- Conservation through Home Herbal Gardens
- Initiation of Community Knowledge Registers
- Maintaining Peoples' Biodiversity Registers
- Ayurveda and traditional herbal healthcare systems – need for revival

Creating awareness amongst villagers for the conservation and cultivation of MAPs. Photo CEE.

These knowledge products were disseminated among communities and other concerned stakeholders around the three MPCAs of Bastiya, Mandal and Jhuni. These MPCAs were selected considering the diversity of geo-agro-climatic conditions, altitude, vegetation and forest type, the local communities and their practices, and the management practices of the MPCAs.

The project team used forums such as informal meetings, group discussions, orientation programmes, workshops, Jathas, and herbal health camps to communicate with the stakeholders. They organised exposure visits for community members to MPCAs and resource agencies. Special efforts were made to establish and strengthen linkages among various stakeholders and to help connect the MAPs cultivators to the market.

The communication strategy and tools developed for the three selected MPCAs were used in the remaining MPCAs of Uttarakhand later. A trainers' manual was also developed to help the SMPB and Forest Department personnel for future communication and training of the community and other stakeholders after the withdrawal of the RCE at the end of the project. The withdrawal strategy and sustainability of the initiative were well planned and, accordingly, the community was knowledgeable and empowered enough to take over.

Defining Stakeholders

For developing the communication material, the RCE team conducted research to understand what messages needed to be communicated, the various media and products to be used, and the appropriateness of the different products for the different messages. Draft products developed were field tested and accordingly revised. Stakeholders were involved in the development throughout. The community appreciated being involved and participants appeared to have enjoyed the process. The exercise was mutually beneficial and enriching, and a huge learning for the RCE team.

Writing pledge for conservation and cultivation of MAPs.

Awareness and Training programme on conservation and cultivation of MAPs. Photo CEE.

Strategy for Primary Stakeholders: *Some Examples*
As part of the communication strategy, park managers, SMPB, forest officials and government marketing units were included when involving the community for promoting the cultivation, storage, transportation, processing and semi processing, and on value addition of MAPs through appropriate policy interventions and amendments.

This initiative also addressed local children. Empowering the young generation was crucial, so they could learn to recognise, respect, revive and adopt the old traditions. Children learned about the MAPs in their area, learned how to prepare 'People's Biodiversity Registers' and document their traditional knowledge and intangible cultural heritage.

The stakeholders were categorised according to their specific roles in the community and their capacity for exerting influence on various aspects of the local lifestyle, traditional practices and economy. They were divided into primary and secondary stakeholders. (See the box above for examples of defining and enabling primary stakeholders). Primary stakeholders are those who have a direct stake in the MPCAs, MPDAs and MAPs. These included MPCA, MPDA management staff of the Forest Department, members of the Biodiversity Management Committees, Local Management Groups and Van Panchayats; the cultivators who include women and youth; the NTFP collectors who were also primarily women and youth; the community leaders (*Sarpanch, Gram Pradhans*) and other members and office bearers of the Panchayati Raj Institutions; local community groups such as self-help groups, women's groups and youth groups; healthcare workers of both traditional and modern systems, and

include Ayurveda doctors, traditional herbal healers, accredited social health activists, auxiliary nurse midwives and veterinary staff; traders and business agencies such as wholesale buyers of MAPs; and the pharmaceutical and Ayurveda companies that have their industrial plants in Uttarakhand and also outside the state.

The secondary stakeholders influence the MAPs sector indirectly. These include children, both school-going and non-school-going, and youth; educators including Anganwadi[2] workers, primary and secondary-school teachers; staff of academic and research institutions that help develop methods and techniques to add value to the cultivation and processing techniques for MAPs; and local NGOs and CBOs who work to generate awareness and action.

Communication Strategy Aligned to Different Stakeholders

The key messages, such as: What is an MPCA and what is its role? What are MAPs, GSMPs and Flagship Species? Why are they important? increased the understanding of the stakeholders about the importance of MAPs and the threats they faced. Messages on threats to MAPs brought an observable change in mind-sets and behaviours of the stakeholders with respect to local biodiversity, especially MAPs. Messages on Uttarakhand the Herbal State and its traditional herbal healthcare system developed a sense of pride in belonging to the Herbal and Organic state, and a sense of ownership of its biodiversity and medicinal resources. Messages on what we mean by 'sustainability' and 'conservation', and how MAPs are linked to people's lives and livelihoods clarified important concepts and terminology, and increased their awareness about these important issues.

To ensure that the desired behaviour change took place amongst the stakeholders, it was important to segregate relevant key messages, and convey those using appropriate IEC products and methodologies of communication. This chapter illustrates the application for such a fine-tuned approach focusing on application of the strategy to two key stakeholder groups – the MPCA management and cultivators.

For MPCA management staff, the focus was on strengthening the Biodiversity Management Committees (BMCs *http://nbaindia.org/content/20/35/1/bmc.html*). For this, the IEC materials and methodology used were a Foresters' Manual with teaching aids, all other knowledge products, the orientation programme, training programme, and exposure visits for BMC and Van Panchayat members

to other 'good practices' sites. The key messages selected were about the significance of medicinal plants vis-a-vis other important forest species and products such as wildlife, timber, NTFPs; importance of scientific and sustainable harvesting; how to make the harvesting process more participatory, inclusive and scientific so as to benefit a maximum number of people; how to train local communities in conservation and sustainability measures (with the help of the training manual, teaching aids and communication tools); what type of training to impart to different stakeholders; and roles, responsibilities and scope of BMCs and Van Panchayats.

Similarly, for cultivators the focus was on adopting cultivation of MAPS. The products and forums used were radio episodes, posters, brochures, panchang (a Hindu calendar and almanac), orientation programmes (with teaching aids), exposure visits, workshops for promising cultivators, and sharing of success stories. The messages communicated sought to bring clarity regarding species, processes, techniques and markets. Some of the specific messages were: What are nurseries, home herbal gardens and tissue culture? What can be cultivated in the prevailing agro-climatic conditions? Who can help the cultivators with subsidies, training, planting material and marketing links? The behaviour change expected amongst farmers was their acceptance of MAPs cultivation as a livelihood option.

Improved Nursery of MAPs. Photo CEE.

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[2] Anganwadis were initially set up to treat child hunger and malnutrition. A typical Anganwadi centre provides basic healthcare in Indian villages. Its basic healthcare activities include contraceptive counselling and supply, nutrition education and supplementation, as well as pre-school activities.

Given the range and variety of stakeholders – illiterate and less literate to literate farmers, middle men, business men, herbal healers; to well-educated students, teachers, junior-level officials, field workers; to highly educated researchers, corporate officials, senior-level officials, policy makers and planners – the identification and development of IEC products posed a big challenge. The use of these products was also hugely varied (*see below for a description*). Posters with limited text and more illustrations, the Panchang, films and radio episodes were found more suitable for the illiterate and less literate. The diaries, wall and table calendars and brochures in English were more appropriate for officials, policy makers, planners, researchers and corporates. Films were made in both languages, Hindi and English, with subtitles in the alternate language. The radio episodes were aired on Sunday evenings, considering the convenience and availability of the public.

Information, Education, Communication Knowledge Products

Diverse IEC materials like year planners, posters, brochures, office diaries, desk calendars, banners, book labels, and even traditional Panchang (a Hindu calendar and almanac) were produced (in both English and Hindi) as communication materials for different user groups. In addition, other audio-visual materials like radio programmes and videos helped communicate the messages effectively. The central messages were regarding knowing, utilising, cultivating and conserving medicinal and aromatic plants. The specific messages included information about traditional healthcare systems in the region, important medicinal plants, habitats, parts used, threat status in the wild, sustainable harvest techniques, home herbal gardens and nurseries, village botanists, importance of people's biodiversity register and so on. Important concepts and terminologies such as Medicinal Plant Conservation Area, Medicinal Plant Development Area, Biodiversity Management Committees, Globally Significant Medicinal Plants, and Flagship Globally Significant Medicinal Plants were included. A complete list of organisations associated with the sector was also published. The materials included maps of the State's seven MPCAs, accessibility, nearest tourist places and information about the area. Some general topics related to conservation and sustainable use such as forest fires and water management were included. For specific stakeholders like medicinal plant cultivators, the materials provided guidance on potentials of commercial cultivation, market information on

demand, cultivation practices, how to make informed choices for cultivation, contact information of various academic, research and manufacturing organisations for support and so on were provided. Materials like the book labels were especially useful and attractive for school children to help them understand and reconnect with their local healthcare traditions. As part of community health messages and information on various seasonal health issues, tips for healthy living through simple self-help practices, diet (including seasonal fruits, vegetables, spices) and lifestyle were provided.

The radio programmes offered by the state-run radio every Sunday evening aired detailed messages on the sector to which the listeners could write back for more information. The large numbers of letters and the quality of queries received indicated the success of the radio programme. Seven short video films of telecast quality made on different subjects were screened and disseminated widely[3]. Videos were also prepared on special occasions like the 'International Day for Biological Diversity' and International Women's Day to create awareness about biodiversity and to promote conservation and cultivation of medicinal and aromatic plant diversity.

A Training of Trainers (ToT) manual was produced (in English) for officials of the Forest Department, State Medicinal Plant Board and NGOs, and institutions interested in conducting MAPs-related training programmes. It was a comprehensive, step-by-step training manual, complete with teaching aids, communication tools and training sessions.

Challenges

Herbal healing has remained a tradition in the IHR as most areas are remote and therefore modern health facilities are not easily accessible. Nowadays this tradition is becoming rare as the relevant knowledge stays with the older generation and is not being transmitted to younger generations. At the same time the pressure of MAPs collection is continuously denuding their reserve in the wild. Though MPCAs have been set up by the Forest Department for the conservation of MAPs, the desired results will not be achieved without active participation of the community. The communication between the MPCA managers who are people of the Forest Department and the community living in the surrounding of the MPCA is poor, resulting in lack of community involvement, and

Field testing IEC material developed. Photo CEE.

at times even in conflict. The community is not willing to take up cultivation of MAPs for many reasons, such as water scarcity; the long transition time required to get economic returns; lack of knowledge of agro-technologies, the demand and supply chain; and meagre economic gains due to poor marketing information and the dominance of middlemen.

Opportunities

Protocols for a number of threatened, high-value MAPs have been established. The High Altitude Plant Physiology Research Centre (HAPPRC *http://www.hnbgu.ac.in/forms/departments.aspx?lid=259#*) of H N Bahuguna Garhwal University, Srinagar; Herbal Research Development Institute (HRDI *www.hrdiuk.org*) and Centre for Aromatic Plants (CAP *www.capuk.in/*) of the Government of Uttarakhand have developed protocols and nursery of important MAPs to promote their cultivation in the State. GB Pant National Institute of Himalayan Environment and Development, Kosi, Almora (*www.gbpihed.gov.in/*) has developed protocols for important MAPs and has been providing technical knowhow and trainings to farmers on MAPs cultivation. Central Institute of Medicinal and Aromatic Plants (CIMAP *www.cimap.res.in*), Lucknow, a CSIR (Council of Scientific and Industrial Research *www.csir.res.in/*) has been making a significant contribution in promoting cultivation of MAPs. All these institutions provide their services free of cost and charge for the planting material at a subsidised rate. They regularly organise trainings to concerned stakeholders as part of their mandate.

Government as well as authorised private nurseries and research institutions now provide the planting material either free of cost or at a subsidised price. A few progressive farmers have started the cultivation of MAPs. Two 'Harvesting Sites' or Medicinal Plants Development Areas (MPDAs) have been set up to demonstrate and teach the community about scientific and sustainable harvesting of MAPs from the wild through collection of seeds and further multiplication and enrichment of the population of native MAPs. Provisions have been made for community participation in MPDA management through the formation of Local Management Groups meant for the upkeep and maintenance of MPCAs. The GEF-GoI-UNDP project has now ended but the activities initiated have been sustained, and are even being scaled up and diversified.

Local Vaidyas (traditional healers) still exist in the area in significant numbers although few people consult them. Knowledge of these Vaidyas has been tried and tested over time. These Vaidyas are being involved across the MPCAs for technical guidance on the use of MAPs, their economic value and demand in the market. The project documented their knowledge by involving youth in the exercise.

[3] 'Herbal Healers of Himalaya' *https://www.youtube.com/watch?v=BJPtVBW9nWc (Hindi)*; *https://www.youtube.com/watch?v=JRs67959TT8 (English)*; 'Ukha Devi-Who after Her?'- Knowledge and healthcare services rendered by a traditional health practitioner, in the far-flung Johar Valley *https://www.youtube.com/watch?v=dFhhLB69Gz4)*; 'Vaidya', a documentary *https://www.youtube.com/watch?v=joLKk99xtPc* – based on the traditional practices of two traditional herbal healers, Ram Krishna Pokhriyal of Pauri Garhwal and Ganga Singh Bohra of the village Sukhi Dang, Tanakpur, District Champawat.; 'MPCA and MPDA' *https://www.youtube.com/watch?v=3eh0jEeuYdA*

Year Planner (2013) on MAPs.

A lot more remains to be documented, and the process is continuing. Besides their existing knowledge, the Vaidyas also research and develop new knowledge. Youth from the MPCAs were given a chance to be trained as 'Village Botanists'. They were taught simple taxonomy after which they become able to identify the MAPs and other local biodiversity.

The project addressed several Sustainable Development Goals (SDGs). The establishment of MPCAs and MPDAs, making planting material and technical knowhow available at the doorstep of the villagers, organising free training and capacity building programmes for the farmers interested in taking up MAPs cultivation, fixing a minimum support price for MAPs produce, regulating the collection from the wild, introducing relevant courses to promote the MAPs sector, encouraging Vaidya, recognising their skills and importance for society, all strengthen SDG 3 'Ensure healthy lives and promote well-being for all at all ages'. Promotion of conservation and cultivation of MAPs by way of enhancing the economy of farmers supports SDG 1 'End poverty in all its forms everywhere'; SDG 8 'Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all' and SDG 15 'Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, and halt biodiversity loss'.

Herbal healthcare is now gaining importance in the world; therefore, the MAPs sector has bright prospects. MAPs grow well in Himalaya for edaphic, climatic and a variety of other reasons and, therefore, their demand has been increasing. They are now fetching higher prices than in the past.

The project was implemented by RCE Srinagar and CEE Himalaya (*www.ceeindia.org*) and was supported by GEF-GoI-UNDP. Its efforts are continuing, implementing the knowledge developed and experience gathered, thereby helping the people in IHR. Mainstreaming efforts to further strengthen the MAPs sector continue, and the concerned government departments are trying their best to promote the sector. Using ESD principles in making effective communication materials and strategy has played a significant role in bringing better health and well-being to the people of the Indian Himalayan Region.

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#MsiaEndsDengue :
A UNIQUE COMMUNITY-BASED COLLABORATION MODEL OF ACADEMIA-NGO IN CURBING DENGUE EPIDEMICS

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Abstract

Since 2014, the dengue endemic has been affecting Malaysia worse than it has in the past, resulting in a three-fold rise in dengue mortality. Empirical findings of trend, pattern and the associated dengue virus serotypes indicate that dengue outbreaks are expected to continue in Malaysia throughout the 21st century. Today, 40% of the worlds' population lives in high-risk dengue areas, and the World Health Organization estimates 50 to 100 million infections annually. This study aims to introduce the first national community-based-model known as *#MsiaEndsDengue*, comprising academia, University of Malaya and Non-Governmental Organisations (NGOs) including the Islamic Medical Association of Malaysia (IMAM), Malaysian Integrated Medical Professionals Associations (MIMPA), Pertubuhan IKRAM Malaysia, and I Malaysia for Youth (iM4U), formed to complement the Ministry of Health in the effort to curb dengue.

This collaboration creates a holistic platform integrating science of medicine, entomology, building designs and structures, information technology, as well as human factors in order to provide a more sustainable environment. Throughout the three years of collaboration, this programme has shown positive impacts from a myriad of perspectives. The first Dengue 1 Stop Centre (D1SC) was officially launched in November 2014. Student volunteers from the University of Malaya (UM) were engaged to equip the centre as a place to educate local communities about dengue. This 'blue ocean model' offers a platform for community empowering programmes such as Training of Trainers, Seek & Destroy, and even door-to-door facilitation on dengue prevention. In the niche of education, *#MsiaEndsDengue* has spearheaded a dengue awareness module for children, which was successfully incorporated into a series of edutainment programmes known as Teddy Bear Hospital. *#MsiaEndsDengue* has won several awards from UM and it has also received Intellectual Property Right registration for the Building Condition Assessment findings and is awaiting approval for the invention of an anti-mosquito floor trap.

Research output of the programme has been published in indexed journals contributing to the pool of knowledge. This model has proven that NGOs and academia have huge potential in empowering the community to curb dengue.

Introduction

Dengue is endemic in Malaysia, but the recent skyrocketing dengue cases have placed Malaysia as the third hardest hit among the Western Pacific Region countries, which is alarming (*Mohd-Zaki, Brett, Ismail and L'Azou, 2014*). Yearly comparisons released by the Malaysian Ministry of Health (MOH) highlighted a 250% increase in the incidence rate of dengue in 2014 as compared to the same period in 2013; dengue claimed 165 lives in 2015 against 59 the year before (*Pang and Loh, 2016*). Empirical findings of trend and pattern of dengue and the associated dengue virus serotypes alert us to the likelihood that dengue outbreaks can be expected to occur continuously in Malaysia throughout the 21st century (*Abubakar and Shafee, 2002*).

Evidently, in Malaysia, 70 to 80% of the reported dengue cases came from the dense population and rapid development activities in the urban areas (*Ministry of Health, 2010*). However, a recent study highlighted that similar seroprevalence rates between urban and rural samples indicate that dengue is no longer confined to urban areas. With the high dengue immunoglobin G (IgG)[1] seropositivity found in the Malaysian population, dengue is headed for a long duration endemicity (*Muhammad Azami et al., 2011*).

Malaysia has taken many proactive actions to prevent dengue. The National Dengue Committee was established in 2014 with collaboration among seven ministries and agencies, namely, the Ministry of Urban Well-being, Housing and Local Government; Ministry of Works; Ministry of Communications and Multimedia; Ministry of Education; Ministry of Home Affairs; Ministry of Human Resources; and the State Governments. The committee has developed the National Dengue Strategic Plan (2015-2020) to mitigate dengue-related problems.

[1] It is a type of antibody in response to infectious diseases.

Aligned with this, the *#MsiaEndsDengue* collaboration aims to achieve Sustainable Development Goals, particularly Goals 3 and 11 (Diagram below). Goal 3 seeks to ensure good health and well-being for all, at every stage of life. *#MsiaEndsDengue* addresses core issues pertaining to dengue, primarily preventive measures. This is also closely aligned to Goal 11, which is a call to "ensure access for all to adequate, safe, and affordable housing and basic services and upgrade slums". Through the *#MsiaEndsDengue* programme, awareness is promoted among communities to recognise the impact of vector-borne diseases and work is completed with control experts to build resilient settlements where the risk of dengue is greatly reduced.

Targeted SDGs: Goal 3 and Goal 11 (United Nations, 2017).

The Collaboration Model

Aligned with the government initiative and efforts, a multidisciplinary collaboration was established involving a myriad of expertise from academic institutions (on built environment and entomology), the medical profession and community driven NGOs. This collaboration serves as a platform for a deeper understanding of dengue and facilitates the formulation of preventive strategies across the community. This knowledge is useful especially when it is practically applied with the right attitude. Alongside the existing 'Search & Destroy' activities conducted by the community, knowledge derived from the research is useful to help the community in tailoring their search of the Aedes mosquito breeding areas based on different types of buildings and different building elements. For example, the Search & Destroy strategy for terrace houses is different from that for 14-storey apartment blocks as both constitute different risk factors. Dried leaves more commonly obstruct gutters of terrace houses, especially when surrounded by tall trees. Subsequently, these obstructed gutters lead to weeks of stagnant water that is a perfect breeding ground for mosquitoes. In contrast, obstructed floor traps and uneven flat roofs are the common breeding areas in high-rise apartments. Therefore applying different strategies will potentially save cost and time.
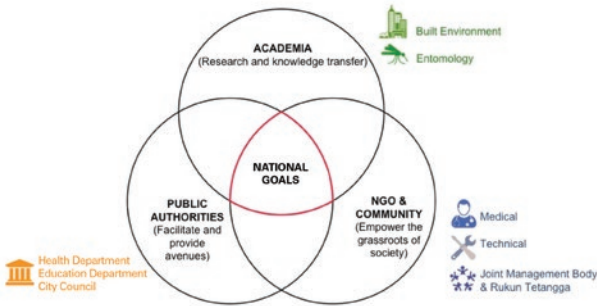
The #MsiaEndsDengue *Collaboration Model.*

Through this collaboration, a holistic approach is attained integrating the science of medicine, entomology, building design and structures, information technology, as well as the human factor *en route* to creating a more sustainable environment to reduce dengue within the country.

The above diagram shows a unique multidisciplinary collaboration that was formed taking into account a holistic strategy with a common goal. This model comprises of three main entities, which are the NGOs and community, academic institutions and the public authorities. Each party brought their respective niche and strength into this module to complement each other. As a result, a chain of reactions was seen as a result of planning just a simple awareness campaign snowballing into the invention of possible preventive measures. For example, in the initial stage of the campaign, all the NGOs worked together with the Ministry of Health for 'training of trainers' sessions. These sessions were vital for creating a sound understanding among the volunteers about the life cycle of the Aedes mosquito, how Aedes carries the dengue virus, how the virus is transmitted and subsequently leads to an epidemic. Awareness among the volunteers was emphasised throughout the campaign to ensure effective community engagement and Search & Destroy activities.

The University of Malaya (UM) spearheaded a building survey around the areas identified as dengue 'hotspots'. Meanwhile, in the same setting other NGOs, namely, the Islamic Medical Association of Malaysia (IMAM), Malaysian Integrated Medical Professionals Association (MIMPA), Pertubuhan IKRAM Malaysia, and iMalaysia for Youth (iM4U), helped distribute leaflets, and educated the locals by engaging in Search & Destroy of the dengue breeding sites. Students and lecturers from UM, specifically from the Quantity Surveying department, applied their knowledge on building structures to look for building defects and conditions that could potentially be breeding grounds for the Aedes mosquito. With the facilitation and approval from the public authority and cooperation from the community leaders, the whole process became more effective. The outcome of this survey was shared with the

Ministry and published in a journal (*Zainon et al., 2016*). The opportunity to engage with the community and to assess the building conditions sparked interest among the students to innovate and be part of solutions. This is a great example of how academic institutions can contribute to the pool of knowledge and impact the community simultaneously. From the academic perspective, the *#MsiaEndsDengue* module has a research outcome, which may potentially change the policy, thereby providing potential solutions to a global threat.

On the other hand, NGOs such as IMAM focused on the education niche. Based on the belief that the dengue epidemic is the product of human behaviour and actions, education and awareness were IMAM's priority. With doctor members all over the country, IMAM focused on strengthening the root by educating children. Together with UM, they developed a dengue preschool module and used it in multiple kindergartens around the hotspot areas. The main objective was to sow the basic values and fundamentals that sensitise society to the dengue threat. These included teaching them not to litter and how to recycle garbage. These children were explicitly taught about the complications of irresponsible littering such as stagnant water and obstructed drainage which predispose to Aedes breeding. The children were also exposed, via fun games and drawing competitions, to the ways the Aedes mosquito breeds and its life cycle. They also learnt about dengue symptoms and the severity of the complications. The dengue module was successfully expanded nationally and incorporated into IMAM's Teddy Bear Hospital project, described later in this article. The module and the Teddy Bear Hospital projects have taken a big leap with several corporate bodies such as AEON, Petrosains and others providing venues and funds for UM and IMAM to reach the target audience effectively.

MIMPA and iM4U utilised their links with the media and the government to help spread awareness about this campaign on a wider scale. Appearances in the media such as Astro[2] and in newspapers helped the general public know what *#MsiaEndsDengue* was about. It certainly helped the public to realise that dengue is not a war only for the Ministry of Health (MOH), but a war for all Malaysians to fight. Therefore, having the MOH, NGOs and academia working on a common platform conveyed a strong message to the public, to "come and join us!"

The local authorities such as the Health Department, Education Department, City Council, and community leaders played a pivotal role. Their commitment to ensuring the smooth running of every programme was a testimony to how much Malaysians want to eradicate dengue. Without their influence, the effectiveness

of the campaign would not be the same. Each party complemented the others, with a common understanding and a common goal.

This model was successfully presented at the 34th FIMA Scientific Congress in Istanbul, Turkey, themed Health in Africa (*Abd-Samat et al., 2017*). Five hundred delegates from all over the world attended this congress with the aim to share experiences to improve health in Africa.

Achievements

The collaboration aims to fight dengue in the long run by empowering the community to do it rather than doing it for them. The formula is to get the community directly involved in these efforts, by having multi-stakeholder networking through knowledge transfer and community development activities to encourage collaborative learning, social change and lifelong learning. A few successful activities conducted since the establishment of this collaboration are described in this section.

Building Condition Assessment

The UM team conducted a building-condition assessment at dengue hotspots aiming to inspect the common building elements that promote Aedes breeding. High-rise residential buildings at three different locations in Lembah Pantai were selected for the assessment. These sites were identified by the Ministry of Health as dengue hotspots in 2014 based on the incidence of dengue cases reported.

The first site was an 18-storey condominium that has four blocks, 316 housing units and 1,364 residents. The second site consisted of flats of the People's Housing Programme (*Programme Perumahan Rakyat, PPR*) consisting of two blocks of four floors each, with 64 residential units and 320 residents. The third site was also a PPR development of four blocks of apartments, with 13 floors each, consisting of 320 residential units and 1,280 residents. The local authorities and the Joint Management Body (JMB) of the respective residences had granted approvals for assessment of the buildings from the ground level to the rooftop.

In a period of three months, the team conducted five visits on separate occasions at each site to identify the building elements that had become Aedes breeding spots. Six researchers participated in each visit. The inspection covered the outdoor areas, which included building elements such as the roof, gutter, drain, toilet and corridor that were identified as areas prone to mosquito breeding. Samples of larvae found at the breeding spots were collected and tested to ensure that they belonged to Aedes. The findings were tabulated to identify the commonalities among the breeding spots.

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[2] Astro is a Malaysian Pay TV, radio, digital content and consumer services provider.

The assessment found commonalities in building elements that act as catalysts for Aedes breeding, mainly the roof structure, corridor and walkway, and the drainage. Interestingly, the assessment managed to identify new elements that many often overlook as likely mosquito breeding spots, such as, uneven flat floors and uneven rooftops. These apparently occur quite commonly in many buildings in Malaysia. This research also proved claims made by local authorities and researchers, especially the Malaysia Ministry of Health, about the building elements that are contributing to the upsurge in dengue cases by providing ideal conditions for the Aedes to breed. Many of these elements, however, were a result not only of the design of the buildings, but also were dependent on the degree of care and meticulousness of a builder's work during construction. The findings pose a strong claim for further research on environmental factors and physical building conditions that result in the creation of ideal Aedes breeding spaces. Future research may provide an understanding of the micro elements of building design which contribute to the macro-scale of human sustainable living environments. In addition, it may potentially transform the perspective of building experts in designing buildings and structures. Essentially, understanding elements that contribute to 'dengue-friendly' elements become important factors to be evaluated during every stage in the planning and construction of a building or structure.

The findings of this study were published in the Malaysian Planning Journal (*Zainon et al., 2016*), and have received the Intellectual Property Rights (IPR) registration approval.


Volunteers conducting the Building Condition Assessment.
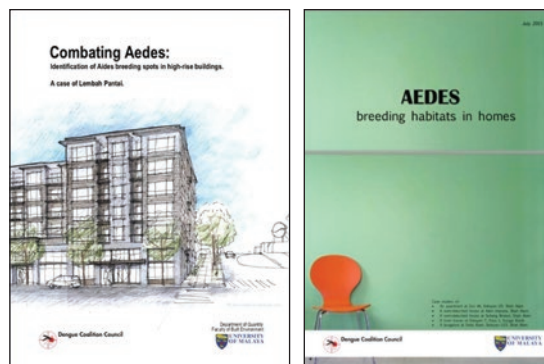
Building Condition Assessment Reports (Zainon and Mohd-Rahim, 2014; Zainon and Mohd-Rahim, 2015).

Dengue 1 Stop Centre

The first Dengue 1 Stop Centre (D1SC) was officially launched in November 2014. Deputy Director General of Health Malaysia inaugurated the D1SC and the representative of the World Health Organization (WHO) Malaysia, Brunei and Singapore, too, was present at the launch. Located in the hotspot area, Pantai Dalam, the centre was fully refurbished by 44 student volunteers from UM. At a cost of less than RM1,000 (USD230), it took only a day to refurbish and transform the vacant shop-lot into a multi-purpose vibrant centre, a testament to the UM student volunteers. The aim of D1SC was to be the central point to educate local communities about dengue. The NGO partner iM4U hired two full-time staff to facilitate the administrative work and ensure continuous communication with the local communities regarding dengue prevention. After two years of its establishment, we believe D1SC contributed to the reduction of dengue cases in Pantai Dalam. It is no longer a hotspot area. As part of its commitment to empowering the volunteers to achieve the objectives, iM4U also contributed a car customised as a *#MsiaEndsDengue* vehicle to aid the mobility of the volunteers, especially during community engagement programmes.
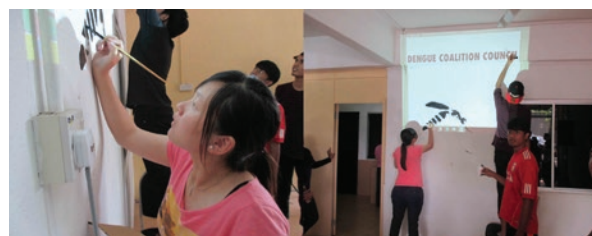
UM volunteers at the Dengue 1 Stop Centre.

The Dengue 1 Stop Centre launch.

A car sponsored by iM4u to aid the mobility of volunteers.

Training of Trainers

Through D1SC, this collaboration has managed to conduct community empowerment programmes such as Training of Trainers and door-to-door facilitation on dengue prevention. Eighty participants went through several series of Training of Trainers using the module on dengue prevention based on the COMBI (communication for behavioural impact – a WHO model) model.

Training of Trainers conducted by UM and MIMPA volunteers at UM Campus.

IMAM facilitators conducting a Training of Trainers session at UM Campus.

Seek & Destroy

The main objective of the Seek & Destroy activity was to locate mosquito breeding areas and to eliminate them. Destroying the vectors is proven to prevent outbreaks of the respective diseases. The volunteers were therefore shown by the expert from the vector unit of MOH the methods to destroy the larvae. Used tyres, gutters, flowerpots and stagnant water under the fridge were among the sites where larvae were detected. Volunteers were also taught how to use Abate, a larvicide approved by the WHO that effectively kills the larvae population. As transmission of the dengue virus can occur when infected female mosquitoes transmit the virus to their offspring via the eggs transmission, Abate, which contains an ingredient called temephos, can break this cycle by destroying the eggs before they hatch. This eliminates the vector population before becoming adult mosquitoes.

UM, IMAM, MIMPA, and iM4U conducted separate episodes of Seek & Destroy activities at different locations around the hotspot areas. For example, UM and IMAM were in charge of Block 2B Jalan Pantai Dalam Seek & Destroy activities that took place involving members of all the households living in the block, and empowered the community to Seek & Destroy themselves. The team from UM also taught the community how to manage some building elements such as gutters and floor traps in order to prevent them from becoming Aedes breeding grounds.

Seek and destroy.

#MsiaEndsDengue:
Campaign on Building Condition Assessment and on the Usage of Mosquito Repellents

The collaborators participated in the Research Carnival University of Malaya from 7-9 August 2015 with the aim to educate visitors on dengue prevention measures. They taught them the basic techniques of handling building elements that help eliminate dengue breeding spots without damaging the building elements, such as assessing the conditions of roof gutters, floor traps in common areas, and rooftops. At the same time, during the carnival, visitors, including children, were given free mosquito repellents and were taught how to use them. The *#MsiaEndsDengue* booth received eminent visitors, including the Deputy Minister of Higher Education and the Chairman of UM Board of Directors.

The #MsiaEndsDengue campaign.

Pre-School Dengue Module (PSDM)

IMAM took up children's education as their niche during this campaign. The idea of focusing on children was simply because children are the nation's future. Inculcating the right values and attitudes at a young age are an investment that guarantees success. Therefore IMAM and the UM spearheaded several dengue awareness projects for children. IMAM developed a Pre-School Dengue Module (PSDM) for early learners as a guide for educators, parents or anyone interested in nurturing awareness on dengue among preschool children. This module incorporates scientific and medical concepts pertaining to dengue in a simple but fun and concise way. With the support from UM Community and Sustainability Centre (UMCares), the UM volunteers, IMAM, and iM4U successfully carried out the modules' pilot project at the Tadika Universiti Malaya and Tadika PPR Kerinchi Block C involving 70 children. The module was later introduced

to the general public during the Teddy Bear Hospital programme, taking place in conjunction with the Malaysia Islamic Children's Fair 2015 at the Shah Alam Convention Centre. This project was declared the Award-Winning Social Engagement 2015 in the category Best Project in Community Engagement 2015 by UMCares. The project also received extensive media coverage.

In the following year, UM partnered with IMAM once again to deliver this module during IMAM's Teddy Bear Hospital at Petrosains Playsmart Kuantan, a mini science discovery centre, on 25-27 November 2016. This particular event was broadcast on TV3 during *Malaysia Hari Ini*. The module received overwhelming support and participation from all over Malaysia with 1,100 children and 200 parents visiting the lively booth. The children learnt about the prevention of dengue fever through PSDM as well as through building condition assessment skills. Through fun games, children learnt about the chain of reactions that lead to dengue. At the booth the importance of recycling bins was also emphasised. Children were also shown the results of irresponsible garbage littering. Images of larvae breeding in water cans followed by the complications of dengue virus were shown. These had a powerful impact on the children as they went home and started telling their parents not to dispose of garbage irresponsibly. The success of this project was presented at the Conference of the Academy-Community at the University of Malaya in 2016.

Pilot PSDM Project by UM, IMAM and iM4U.

Since it was first introduced, the Teddy Bear Hospital has been very well received by the public. Many corporate bodies, private and public institutions have come forward to offer venues to conduct the Teddy Bear Hospital programmes. The edutainment concept that is projected through this programme has proven to be very effective in conveying key messages on health issues. Children are exposed to and taught in a fun way, several issues such as handling fractures and wounds, child abuse, symptoms of dengue infection, and dental hygiene, as they embark on the Teddy Bear Hospital temporary play land, which consists of several stations for kids to play and learn in one designated area. All children bring their own teddy or doll to the Teddy Bear Hospital and have to act as its parent as they move from one station to another. Besides educating the children, this concept also effectively helps to disseminate correct information to parents.

UM conducting PSDM module during IMAM's Teddy Bear Hospital.

Invention of the Easy-Maintenance Floor Trap for Dengue Prevention

One of the most intriguing and inspiring outcomes of this campaign was the invention of the Easy-Maintenance Floor Trap. It all began with the community engagement activity held by the volunteers during the building assessment exercise. The UM volunteers found that water logging is one of the main factors contributing to Aedes breeding spots. Following this, a group of UM researchers designed an easy-maintenance floor trap. As the name suggests, it is a user-friendly floor trap that serves its original purpose but with an improvised technical component that allows users to clean it regularly, thus avoiding the undesired clogging. As compared to the conventional floor trap, the newly-invented device has a hook, which can pull out the seal without having to be physically touched. This mechanism prevents dirt from clogging the drains and is thus a preventive strategy for the collection of water.

This invention won the Gold Award in the category of Green and Sustainability at the 5th International Innovation, Invention and Design Competition 2016, Sri Iskandar, Perak. It is also awaiting approval for the Intellectual Property Rights (IPR) registration. Furthermore, this invention won first place during a poster competition held in conjunction with the Conference of the Academy-Community University of Malaya 2016. A customer

satisfaction survey conducted with 60 people from dengue hotspots in Lembah Pantai in 2015 revealed that 88% agreed that this new design serves to prevent mosquito breeding.

Easy-Maintenance Floor Trap.

Unique Aspects of Success

The programme brought about unique outcomes. The latest data on dengue incidence at the hotspots is a testimony to the effectiveness of the programme. For example, the programme was started at Pantai Dalam, which once had the highest number of cases among the dengue hotspots in Malaysia; this is no longer the case.

The success should also be viewed from other perspectives, the first being the collaboration itself, which was a multidisciplinary effort involving entities with different backgrounds and skills. This indicates that government, academia and NGOs can and should carry on working together for a common good. A similar approach should be applied and extrapolated to tackling other health and social issues such as non-communicable diseases and delinquencies. The campaign actually achieved results beyond expectations. Although the initial effort was to merely create and enhance awareness on dengue and its prevention, it went further with the invention of the easy-maintenance floor trap by UM students; development of the preschool dengue module that sent a positive wave throughout Malaysia through the Teddy Bear Hospital projects; and contribution to the pool of knowledge through academic publications that ensued. It is believed that the wide scope of the project will help in achieving the identified Sustainable Development Goals.

The biggest challenge that was faced was to get the community involved. The resistance to change was initially the hardest to break. However, having multiple stakeholders and a close working partnership among the government agencies, NGOs, academics and, most importantly, the community, was the recipe for success. The professional linkages among all the parties ensured smooth running of the programme and expedited funding, licence approvals and implementation of new policies. The involvement of local authorities, too, attracted the

attention of the community and encouraged them to take active part in the programme. This collaboration also drew the interest of private funders to donate so as to fulfil their corporate social responsibility.

Policy Relevance

Aligned with the National Dengue Strategic Plan (2015-2020), *#MsiaEndsDengue* embarked on an inter-agency approach with emphasis on prevention and education. This effort also coincides with the National Cleanliness Policy and Integrated Vector Management in accordance with the Aedes Control Guideline in Construction Sites 2015. The findings of the surveys conducted throughout the campaign reaffirm the importance of adhering to these guidelines. It is worth reiterating that it is vital to consider all the dengue-friendly elements as part of the checklist in the early planning stage of a construction project. Collaboration between the health and technical sectors provides a deeper understanding on the potential breeding points as highlighted in this study. The collaboration model will help in shaping a relevant primary prevention programme across the community. A holistic preventive programme can be adopted which would include standardising the checklist for building assessment for residences and construction projects, implementing compulsory subjects on basic health, dengue and hygiene in preschools, as well as continuous awareness campaigns through social media.

Acknowledgement

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HUMAN VALUES-BASED WATER, SANITATION AND HYGIENE EDUCATION IN KUNMING CITY

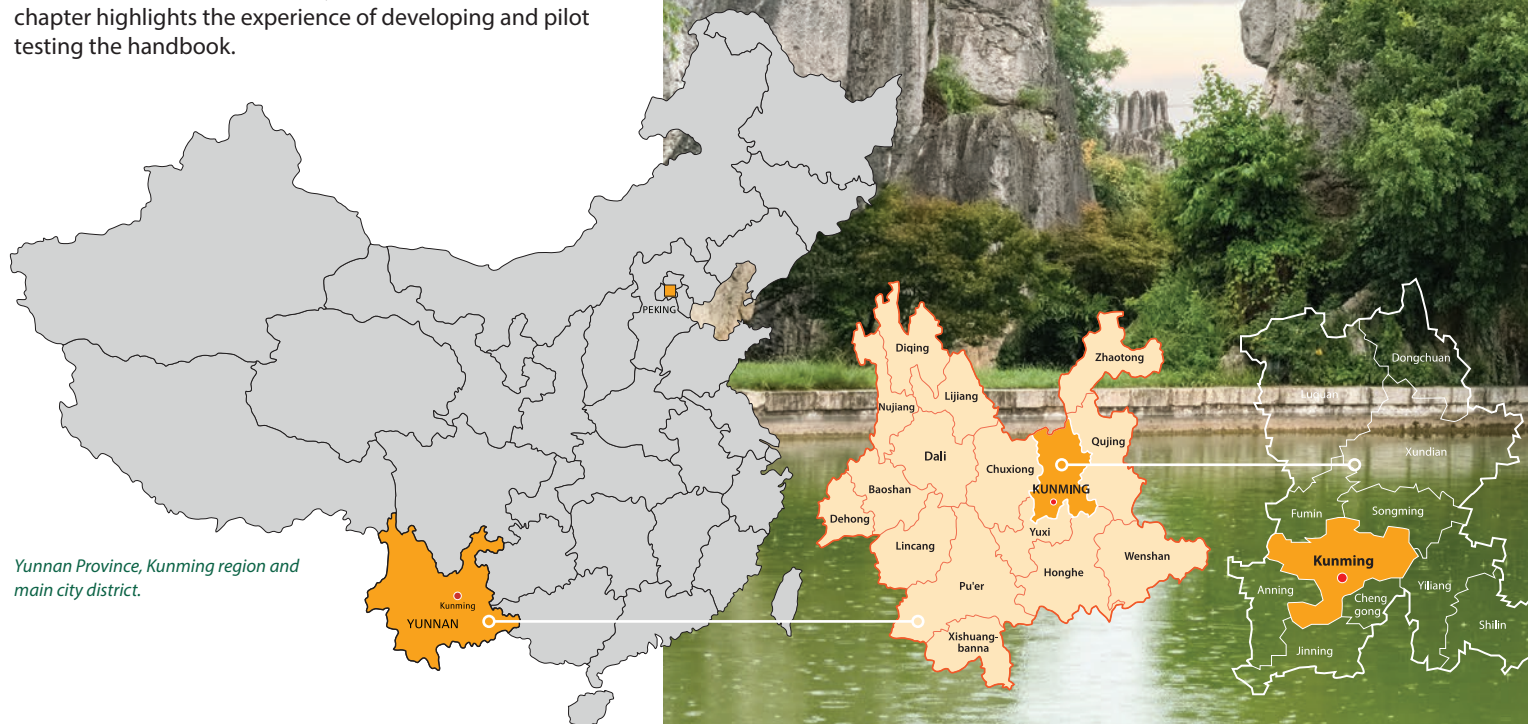Miaoyuan Zhu and Jinliang Wang.

RCE Kunming

Kunming, the capital of Yunnan province, enjoys fame as the "City of Eternal Spring". It is located in southwest China, and has a history of 2,400 years, being China's gateway to South and Southeast Asia. Historically and culturally Kunming is an important city to China, and a significant tourist destination and commercial city in the southwest. With rapid urbanisation, the city's population growth rate is greater than its environmental carrying capacity. The deterioration of environmental quality in Kunming began in the 1970s. Measures have been introduced over the years to ensure that the decision-makers and the public pay more attention to environmental issues. Meanwhile, most NGOs and schools in the Kunming region are dedicated to Environmental Education (EE) and Education for Sustainable Development (ESD). Some enterprises also participate in EE and ESD in order to research how to improve public participation through the combined vision and efforts of enterprises, schools, communities, media and NGOs. RCE Kunming has been playing a noteworthy role in building a network and a platform for sharing knowledge and experiences for the development and promotion of EE and ESD in Kunming.

The Centre for Environmental Education Training (CEET), established in 1999 by Yunnan Normal University, is unique amongst the universities of Yunnan, as a pioneer in EE and ESD development. It is also the first university to carry out EE and ESD in the province. RCE Kunming, which was acknowledged in 2013, is coordinated by CEET. The RCE combines the forces of government, universities and colleges, primary and secondary schools, enterprises, communities, NGOs and media to promote sustainable development with democracy, the advancement of science, and standardisation and systematisation of education.

Context

The United Nations Human Settlements Programme (UN-HABITAT) has been promoting Human Values-based Water, Sanitation and Hygiene Education (HVWSHE) since 2001 (*UN-HABITAT n.d.*)[1]. Extensive work has been done in Africa to bring values-based water education to thousands of schools and improve sanitation facilities and hygiene. Now this work is spreading to Asia and many other countries around the world (*UN-HABITAT n.d.*). The CEET and the College of Tourism and Geography Science, Yunnan Normal University, were given the task of developing a handbook and conducting training for primary and secondary school teachers on how to implement and integrate human values into water education in Kunming. The project allowed teachers to teach insights and skills related to water, sanitation and hygiene issues both in the classroom and outside of it. Students learned about the relationship between daily human activities and water, and how to adopt water friendly actions in the future. This chapter highlights the experience of developing and pilot testing the handbook.

Yunnan Province, Kunming region and main city district.

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[1] See *https://www.ircwash.org/resources/towards-new-water-use-and-sanitation-friendly-ethic-society*; *http://www.seameo.org/_HVWSHE-Toolkit/img/resources. html*

Background

According to UNESCO, almost 40% of the global population still lacks access to basic sanitation. This is due to limited resources, mismanagement of resources and environmental change, resulting in more than two million deaths from water-borne diseases every year (*UNESCO, 2006*).

Kunming, though located at the divide of Jinsha River, Red River and Pearl River, is one of 14 cities facing serious water shortage in China. The mean annual precipitation in Kunming is 1,072.1 mm. The water available in the city per capita is 1,250 cubic meters, which is one-fifth of the per capita average in the province and half of the country's per capita water availability. Especially in Dianchi Lake basin, the water per capita is only 260 cubic meters. This is lower than in Tangshan, Beijing and Tianjin separately, which means the basin is one of the world's areas acutely short of water. Moreover, the water resources in Kunming are distributed unevenly in time and space. Rainfall is heaviest from June to September, which is also the flood season, so the efficient use of water resources is limited; drought and waterlogging disasters are also possible. Furthermore, Kunming's karst[2] formations, characterised by complicated geological conditions and significant natural seepage, also cause serious depletion of water resources. During the dry season the water supply to many residential districts of Kunming City is supplied in turns, which further affects people's essential need for water.

Along with economic development and the expansion of the city, the increased need of water for urban living, industry and agriculture has led to a surge in demand. This has sharply worsened the situation in the ecological environment of the areas of the Dian Lake in Yunnan Province. Other related factors such as low awareness about water conservation, the rise in siltation of the Dian Lake basin, decrease in the flow of water, and severely polluted water entering the lake have resulted in lower water availability and the deterioration of water quality. This has led to an even larger gap between water supply and demand.

Water and Education

In the past, environmental education has paid more attention to environmental protection, but ESD takes "values" as the core of education. It recognises the need to instil human values in children from a very young age. Describing water as essential for human existence and ecosystem sustainability is a good entry point. "UN-HABITAT has chosen five universal Human Values in the Human Values-based Water, Sanitation and Hygiene Education. These are Love, Right Conduct, Peace, Truth and Non-Violence (*UN-HABITAT, 2006*).

- **Love:** is totally unselfish, pure compassion that motivates selfless service for the benefit of others.
- **Right Conduct:** When compassion is put into action, it leads to right conduct.
- **Peace:** is the joy and tranquillity that comes from within. With water education, one must start with the simple needs first.
- **Truth:** is something that does not change. What is true today must be true tomorrow. Truth is eternal.
- **Non-violence:** Non-violence is the culmination of all the previous values. With the impending water shortage in the world, we should not resort to violence to solve problems. Only through Love and Peace can we come to the right solution of sharing, helping one another and serving everyone, which brings us to the value of Right Conduct through the understanding of the value of Truth – that we are all related through water that pervades all living things (*Ayudhya, 1997, 2003*).

We are living in a world of tremendous scientific and technological change. The discoveries in the field of medicine and science and the advancements in the computer industry, for example, have transformed the lives of millions of people around the world. Despite all the developments, one must ask: "Are we any nearer to creating peaceful and harmonious societies for our children to inherit? "The answer is a resounding "No!" Parker J. Palmer wrote in his foreword to Rachael Kessler's (*2000*) book, The Soul of Education: "The 20th Century, for all its scientific and technological amazements, might

Student activities: pass water and make a water wheel.

be described as a century of thin soup, and not only because too many people went hungry. It was a century in which we watered down our own humanity – turning wisdom into information, community into consumerism, politics into manipulation, destiny into DNA – making it increasingly difficult to find nourishment for the hungers of the heart."

Many countries around the world have serious water shortages that affect the lives of millions of people. A large proportion of the world's population does not have proper access to clean water or sanitation facilities, especially in parts of Asia and Africa. It is therefore essential that children worldwide are educated about the value of water, how to use it properly, conserve and protect it. Values-based water education should become a vital part of every school's curriculum. Children should have the opportunity to see and understand the value in everything they do and learn. In this way they will not only become more respectful and careful about water and other natural resources, but will also learn to lead their lives in a way that will promote global peace.

> Education should be for life and not merely a means to make a living. UNESCO promotes the notion of "Lifelong Learning".

Although there already are some learning materials and textbooks on water education, most of them are short on guidance of these values, and are rarely used by schools. Headmasters, teachers and parents pay much more attention to education for entry to higher levels of education and a career than for holistic development of the student. This is due to high population, limited resources for education, and high competition for the limited opportunities for employment (*Zhu et al., 2012*). Secondly often existing curricula are not interesting or practical enough. Another reason is that most of the existing materials do not suit the pedagogical needs of teachers for value based education. Finally, a baseline research conducted by CEET revealed that the teachers' knowledge, attention and skills were low and needed to be improved, and that they had a strong desire to become involved in HVWSHE (*Zhu et al., 2012*). The question that arose from this research was: What is a suitable way to strengthen teachers' capacity for applying ESD methods in the implementation of water education?

The core objective of the handbook project undertaken by RCE Kunming was to enhance the ability of teachers to conduct HVWSHE and create competencies for addressing related issues. With this in mind, a handbook on HVWSHE was prepared. This included an introduction to universal human values, the need for values-based water education, and training and learning methodologies.

Methodology

At the beginning of the project, guidelines were given on how to interpret human values related to water and how to integrate those into all subjects. The teacher's role was to be that of a facilitator and a resource person. A participatory teaching and learning approach was to be followed. The orientation provided led to the compilation of a basket of activity ideas that belong to ESD, in combination with some normative Environmental Education. These small activities could be built into a larger mosaic for an understanding of water. The activities were selected to give teachers a feel for the tremendous variety of educational activities that can be carried out at the school level, such as sitting in silence to raise awareness, singing songs, storytelling, poetry and group activities. The experience revealed that learning can be more fun, both for the teachers and students, when based on real experiences. The focus of the handbook was to help students to understand and respect the value of water.

The three steps leading to the development of the handbook and the accompanying teacher training were:

1) **Team work:** handbook design
2) **Stakeholder participation/strategic communication:** consultation on handbook and training
3) **Approaches to teaching and learning:** Interactive teaching, enquiry-based learning, experiential learning, values education, future problem solving, appropriate assessment.
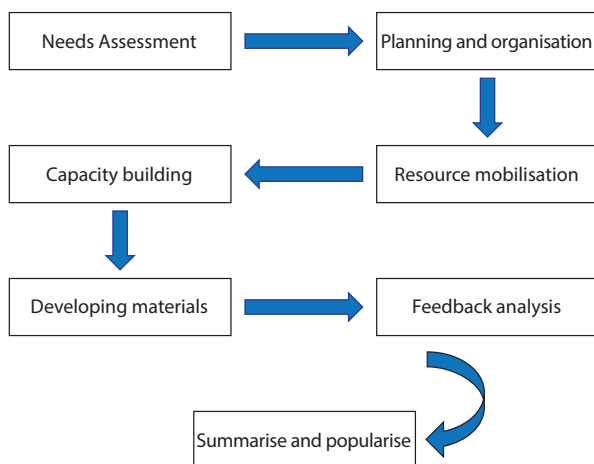
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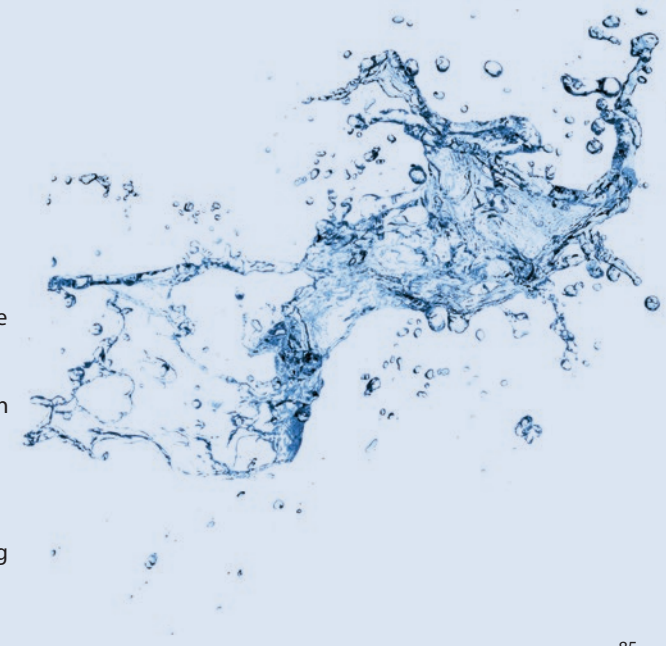
[2] Karst is a distinctive topography formed by the dissolution of soluble rocks by surface water or ground water. *https://geomaps.wr.usgs.gov/parks/cave/karst.html*

Key steps of the Handbook Project

The project took two years to complete and included five parts: Handbook design; Consultation; Handbook development; Pilot training; and Monitoring and Evaluation. Each of these parts is described below.

(a) Handbook Design

The project team based their design on UNESCO's "National Workshop on the Development of Learning Materials". The handbook "The Mirror of Water" went through six phases, namely, needs assessment, planning and organisation, resources mobilisation, capacity building, developing materials and feedback analysis. The handbook is intended for the teachers of Grades 4 to 9 in primary and secondary schools. In primary schools it is meant to be used in Nature, Labour, Chinese, Art, and Topic classes, and in secondary schools in Geography, Biology, Labour, Chinese, Art, Mathematics and Topic classes.

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Needs Assessment ──────▶ Planning and organisation
                                    │
                                    ▼
Capacity building ◀────── Resource mobilisation
        │
        ▼
Developing materials ──────▶ Feedback analysis
                                    │
                                    ▼
              Summarise and popularise
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Phases of Handbook Development Project.

(b) Consultation

RCE Kunming invited stakeholder participation for the consultation process. Key teachers and supervisors were consulted about suitable ways to impart knowledge, skills and consciousness to implement water education based on Human Values. Some experts and members of the government were also consulted about how to strengthen the practicability and sustainability of values-based water education, and how to extend the influence of this kind of education. The experts were from the Environmental Protection Bureau of Kunming, the Department of Education of Yunnan Province, the Centre for Environmental Education and Training, the College of Tourism and Geography Science, and Yunnan Normal University.

(c) Handbook Development

Some experts, teachers and postgraduates formed the team that compiled the handbook. Most of the content originated from materials of the Institute of Sathya Sai Education in Thailand. The compilation was based on the needs identified in the local baseline research, conducted with the help of a questionnaire survey and conversations with stakeholders.

The handbook paid attention to developing the desired attitude and skills, and inculcating the required values through innovative methods and strategies such as:

1) Thoughtfully designing its content and form.
2) Adopting several different modes and diverse approaches such as cartoons, pictures and text, stories, games, poems, crafts and songs.
3) Emphasising outdoor group activities.
4) Involving the government education department.

The educational materials introduced the issues related to water health in two lessons for each of the two school levels. At the elementary level, one lesson focused on "Water and Health" and the other on "Sanitation – Keep Clean". At the secondary level the two lessons were "Water and Personal Hygiene" and "Importance of Water for Health". These lessons mainly convey knowledge about the importance of frequent and proper hand washing and other related health habits, such as infectious diseases caused by improper sanitation, how to test and filter water, knowing when to drink water and what kind of water to drink, how much water is required per day, and to broadly understand the critical link between water and health.

(d) Pilot Training

In the pilot phase, the RCE invited 20 key teachers from a few primary and secondary schools of Kunming for a Cascade training[3] workshop on Values-based Water Education and its Methodologies. The teaching methods adopted were a combination of lectures, interactive teaching, enquiry-based learning, experiential learning, values education, future problem solving, and appropriate assessment. The trainers' training for the selected teachers is expected to multiply the experience when they share it with other teachers and trainers in the field (e.g. education of students, inspectors, directors of schools, education monitors, community organisers, etc.).

Teacher training – how to make a water wheel.

(e) Monitoring and Evaluation of Activities

A supervision and evaluation group was set up consisting of officials from UN-HABITAT, professors from Yunnan Normal University, and teachers and leaders from the Environmental Protection Bureau of Kunming. Evaluation was done both during the implementation phase and at the end of the project to supervise and evaluate the progress and outcomes in real-time. Evaluation was based on questionnaires, and feedback from the trainee and handbook users.

The partners played critical roles in the project. Project design, theoretical research, case studies and project implementation (including financial support) was done by Yunnan Normal University. Kunming Environmental Protection Bureau did the project coordination and supervision. Schools, namely, Yangguang Primary School of Xishan District, Daguan Primary School of Wuhua District, the Thirty-first Middle School of Guandu District, No.14 High School of Wuhua District, Bai Shahe Middle School of Panlong District, and Anning Experimental School conducted the training and implemented water education.

Impact of the Programme

- In the past attention was more focussed on environmental protection and environmental education. But ESD has enriched this vision breaking away from the single topic of environmental protection, thereby integrating lifestyles, gender issues, societal harmony, citizen responsibility, the population problem, morals, culture, and other topics as in this handbook project.

- The most important contribution of the ESD Training Programmes to the project and the RCE's ESD work were the ESD tools (such as systems thinking, participatory activities, team work etc.) and introduction of other innovative approaches like a SWOT analysis.

- After completion of the project, the RCE plans to carry forward its work in the following ways: (1) distribute the handbook to other areas to let more people know how to implement water education and how to reconsider water problems from a new perspective, (2) hold another workshop for teachers to build their educational capacity, and (3) integrate these materials and experiences into its formal curriculum (for example, in environmental education, environmental science, introduction to sustainable development, hydrology).

Reflections

It is important to realise that EE and ESD cannot be essentially or exclusively textbook based. Meaningful EE and ESD call for an entire set of support systems and situations, such as excellent and relevant teaching-learning materials, interactive classroom settings, appropriate syllabi, project-oriented learning, and adequate funds. While all these are significant, the teacher is the key to making the water education experience real. EE and ESD demand that teachers go beyond the boundaries of their traditional subject specialisation. Human values integrated into water education is a new idea and very essential. Most of the knowledge already exists in different subjects; the key to an innovative and meaningful lesson plan are the methodologies, activities and examples based on human values.

Students' paintings – the value of water.

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[3] Cascade or train-the-trainer systems involve training a small group who then pass on their knowledge to other teachers or trainers.
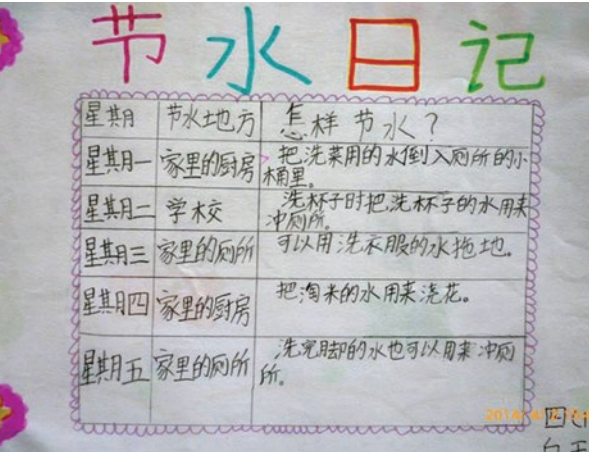
Student diaries – How to save water in different places.

A follow-up questionnaire-based assessment was done in Kunming primary and secondary schools. Of the 320 questionnaires released, 316 questionnaires were recovered, and 302 questionnaires were effective. Based on the data, it was observed that the students in the selected primary and middle schools had higher water environment consciousness. Secondly, all indicators showed that the students' cognitive consciousness of the environment is high. This suggests that the primary and middle school students understood well the close relationship between water and life. They knew the importance of water protection and water conservation, in life and in all activities. Most of the elementary and middle school students also had good water protection and cognitive consciousness. However, the skills of water protection and water conservation have so far not been sufficiently mastered.

It was observed that the primary school students' water-environment consciousness is generally higher than that of the middle school students. On the other hand, the environmental skills and attitudes of primary school students are weaker. It is obvious that the enthusiasm of primary school students for participation in environmental activities is higher than that of middle school students. Primary schools have a relatively relaxed learning environment, therefore knowledge penetration and emotional connection about water care and cherishing can be implemented more easily. As middle school students suffer from a heavier learning burden, they do not have the time to pay attention to the environment. It was also observed that water environment consciousness of female students is significantly higher than that of male students. The findings also showed that parents' educational background has a significant positive influence on the students' environmental consciousness.

It was also observed that the mother's positive influence is slightly higher than that of the father, as mothers spend longer time with the children and therefore have more interaction and communication with them. In this process of socialisation of children, mothers can shape the environmental attitudes and behaviours of the children more easily.

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TEACHING OF HEALTH AND SANITATION PRACTICES AMONG SCHOOL-GOING CHILDREN IN THE STATE OF KARNATAKA:
AN IMPACT STUDY

Santosh R. Sutar and Manjunath K.S.

RCE Bangalore

The purpose of RCE Bangalore is (a) to improve the understanding of the environment through Nature Education programmes, (b) to enhance the understanding of Education for Sustainable Development (ESD) among the public, and (c) to complement the existing education system to address water, sanitation and hygiene education.

The RCE considers schools to be learning laboratories, where good sanitation, personal health and hygiene practiced by children become habits that they carry with them into adulthood. Besides the presence of school toilets, safe drinking water, and clean surroundings, basic information on hygiene improves the learning abilities of these children, their health, and school attendance, especially for girls, with far-reaching consequences on the health of the overall community. Karnataka has been a pioneer among Indian states in showcasing innovative and effective means of implementing school sanitation programmes, especially in the Mysuru district. RCE Bangalore intends to keep the city of Bangalore at the forefront of the WASH (Water, Sanitation and Hygiene) initiatives in schools in the country.

Introduction

In Karnataka, as in other Indian states, many school children suffer from diseases that can be avoided. The intention is to bring about behaviour change among the children, as they learn better hygiene and sanitation practices. This can be accomplished by providing sanitation facilities in schools, and spreading awareness about hygiene and health, among the school children. A comprehensive "School Sanitation, Health and Hygiene Education Programme" was initiated in 2008 by RCE Bangalore, in partnerships with UNICEF and the State Education Department in rural schools of Karnataka. The programme is ongoing.
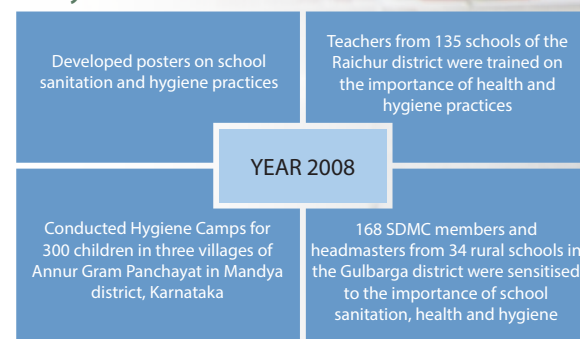
Centre of Environmental Education (CEE), India, the main coordinating organisation behind RCE Bangalore, has been working in the sector of Water and Sanitation for 30 years. Their wealth of knowledge was used to strategise the activities for the programme. This initiative is being

executed through various tried and tested strategies – material development, capacity building / training, construction and maintenance of hand-washing units and WASH facilities, organising hygiene camps, follow-up with schools, monitoring, evaluation and documentation.

The CEE's programme staff have observed that material developed as teaching aids, like posters, story boards, flip charts, and games, lead to a better understanding of the subject. With the help of the materials developed, teachers, students and School Development Management Committee (SDMC) members undergo capacity building. In India people eat with their hands; hand washing therefore becomes a simple yet major entry point towards hygiene. Keeping this in mind, hand washing stations in schools and their use by students is encouraged, through fun activities. Hygiene education camps in schools are an effective method of sensitising children to the importance of sanitation and hygiene.

These efforts are further strengthened by the Government of India's commitment to strengthen Sanitation and Hygiene Education programmes in all rural government schools by providing water and urinal and toilet facilities. A special focus of the government's efforts is to provide separate toilets for girls. For more than nine years, RCE Bangalore has been working on these issues with various stakeholders, such as with the Education Department, donors, school children, teachers, women's groups and the local community. This will allow mainstreaming this programme within the existing education system, to ensure its sustainability with the desired outcomes.

Yearly Initiatives Since 2008

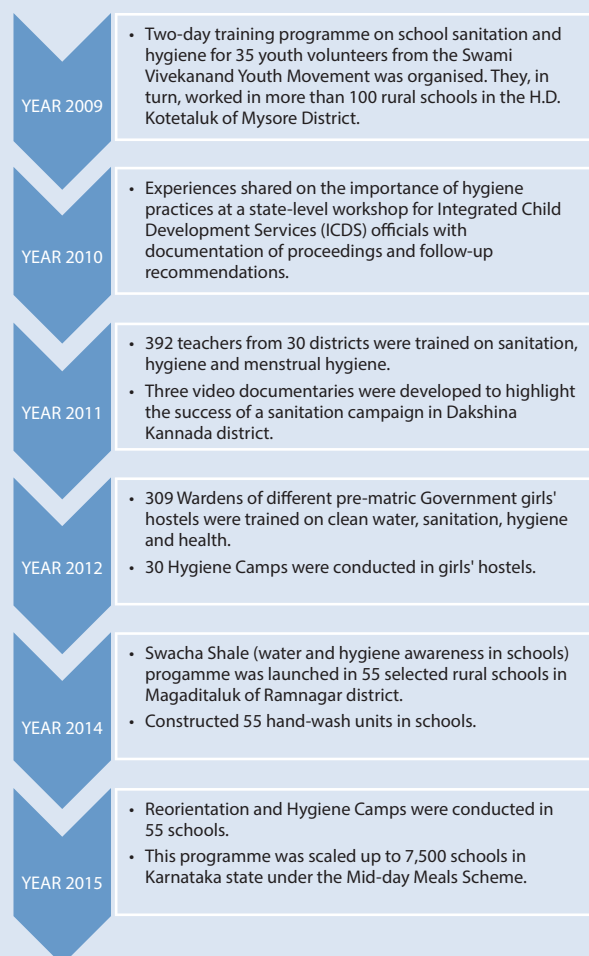|	
Developed posters on school sanitation and hygiene practices	Teachers from 135 schools of the Raichur district were trained on the importance of health and hygiene practices
YEAR 2008	
Conducted Hygiene Camps for 300 children in three villages of Annur Gram Panchayat in Mandya district, Karnataka	168 SDMC members and headmasters from 34 rural schools in the Gulbarga district were sensitised to the importance of school sanitation, health and hygiene

Yearly initiatives since 2008.

Five of the ten top killer diseases of children aged 1-5 in rural areas are related to water and sanitation. 0.6-0.7 million children die of diarrhoea in India annually, almost 2,000 every day.

(Unicomb, 2014)

Photo credit: RCE Bangalore / CEE

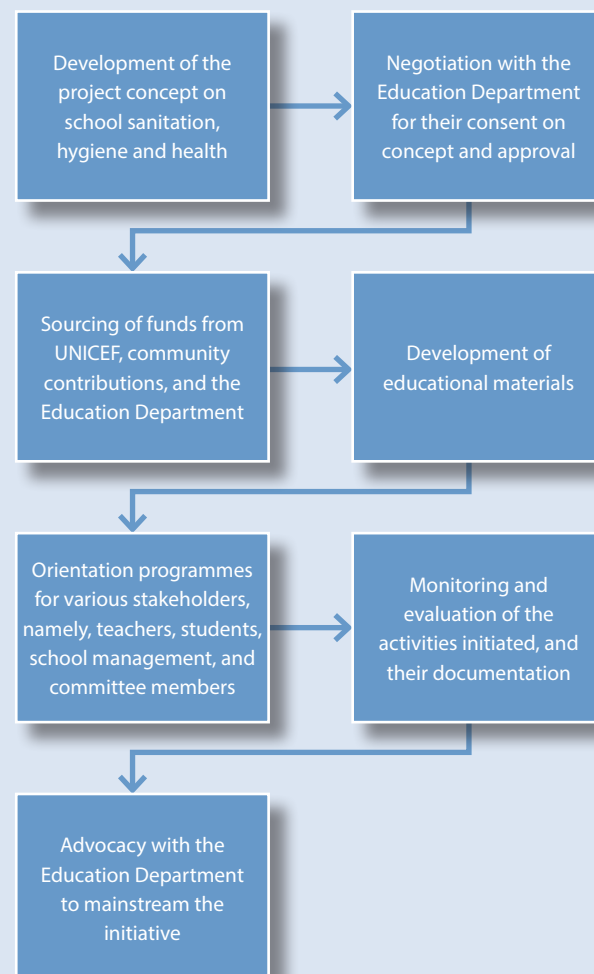| YEAR	
YEAR 2009	• Two-day training programme on school sanitation and hygiene for 35 youth volunteers from the Swami Vivekanand Youth Movement was organised. They, in turn, worked in more than 100 rural schools in the H.D. Kotetaluk of Mysore District.
YEAR 2010	• Experiences shared on the importance of hygiene practices at a state-level workshop for Integrated Child Development Services (ICDS) officials with documentation of proceedings and follow-up recommendations.
YEAR 2011	• 392 teachers from 30 districts were trained on sanitation, hygiene and menstrual hygiene. • Three video documentaries were developed to highlight the success of a sanitation campaign in Dakshina Kannada district.
YEAR 2012	• 309 Wardens of different pre-matric Government girls' hostels were trained on clean water, sanitation, hygiene and health. • 30 Hygiene Camps were conducted in girls' hostels.
YEAR 2014	• Swacha Shale (water and hygiene awareness in schools) progamme was launched in 55 selected rural schools in Magaditaluk of Ramnagar district. • Constructed 55 hand-wash units in schools.
YEAR 2015	• Reorientation and Hygiene Camps were conducted in 55 schools. • This programme was scaled up to 7,500 schools in Karnataka state under the Mid-day Meals Scheme.

Hand washing with soap has been cited as one of the most cost-effective interventions to prevent diarrhoea-related deaths and disease.

(Cairncross and Valdmanis, 2006)

Processes

The processes are divided into the following activities:

- Development of the project concept on school sanitation, hygiene and health
- Negotiation with the Education Department for their consent on concept and approval
- Sourcing of funds from UNICEF, community contributions, and the Education Department
- Development of educational materials
- Orientation programmes for various stakeholders, namely, teachers, students, school management, and committee members
- Monitoring and evaluation of the activities initiated, and their documentation
- Advocacy with the Education Department to mainstream the initiative

Development of Project Concepts on School Sanitation, Hygiene and Health

For the conceptualisation of the project, the availability of toilets, drinking water, and hand washing stations in the schools was considered. A survey conducted by the 'Assessment Survey Evaluation Research (ASER)' in 2009 indicated that 51.9% of primary schools did not have usable toilets and 11.5% had no toilets at all (*ASER Centre n.d.*).

Further, the Right to Education Act 2009 envisaged the provision of safe drinking water in schools and a separate toilet for boys and girls in every school. It was expected that all the primary schools would get sanitation and water facilities and that they would use them properly. Keeping these developments in mind, the project was conceptualised (*RighttoEducation.in n.d.*).

Negotiation with the Education Department on Consent for Concept and Approval

RCE Bangalore sees itself as a facilitator of the project. The main objective is to strengthen the existing systems, so that they become robust enough to work on their own. The state's school education department is the system that needs strengthening, and hence the Education Department was kept in the loop of all activities at all times.

Sourcing of Funds from UNICEF, Community Contribution and Education Department

Funds for the project were received from UNICEF. Contributions in cash or in kind were also made by the School Development Management Committee (SDMC), the community, and the Education Department, to ensure they would have ownership of the programme.

Development of Educational Materials

Teaching aids such as posters, games, a teachers' training manual, flipcharts, story boards, and a song booklet were developed to ensure better learnings and teaching experiences.

Orientation Programmes for Various Stakeholders

Capacity building of the stakeholders, such as teachers, students, and school management committee members, was important. This ensured that everyone in the chain understood the importance of hygiene education, and that the children receive the same information from school and from home. School Management Committee Members included the parents, the principal and local authorities.

Follow Up and Evaluation of the Activities and Documentation

Follow up and evaluation allowed for learnings from the programme, and to assist schools in need of it. It was also used to understand how well the programme had been executed.

Advocacy to Mainstream the Initiative

To scale up the programme, the evaluation study was used as an advocacy tool. Once the Education Department realises the programme's success, it can be scaled up to the entire state.

Photo credit: RCE Bangalore / CEE

Outcomes
The outcomes from this initiative are as follows:

Water and Sanitation in Karnataka Schools
The sanitation scenario was starkly different, compared to when the initiative started in 2008. This is the result of joint efforts by various state agencies, NGOs, and Community Based Organisations (CBOs). Data published by the District Information System for Education (DISE) for 2013-14, showed the state had 61,369 schools, of which 26,792 were lower primary schools, 30,715 upper primary schools and 3,886 high schools. 99% of the schools have functional boys' toilets and 99% have functional girls' toilets, but only 29% of girls' toilets and 29% of boys' toilets have facilities for hand-washing. Drinking water facilities are available in 99% of schools (*District Information System for Education n.d.*).

Role of the School Education Department
The programme was a joint initiative of RCE Bangalore and the state School Education Department, with support from UNICEF. The School Education Department participated in all the phases of the programme. The School Education Department installed, monitored, and evaluated, all hand-wash units. RCE Bangalore coordinated and streamlined the activities with the Department.

Funds for the Programme
Funds for the programme were received from UNICEF, the state Education Department and the community. UNICEF provided funds for facilitation and capacity building of the stakeholders. The state Education Department organised the logistics for teachers to participate in these capacity building and training programmes. They also monitored and evaluated the project. The community volunteered to construct toilets and hand wash stations, and provided funds for maintenance of these toilets (soap, brushes etc.).

Development of Information, Education and Communication (IEC) Materials
As a part of this initiative, IEC materials on sanitation and hygiene were developed in a consultative workshop, involving various stakeholders, such as teachers, experts and Education Department staff. These materials were tested in schools with teachers and students. Based on these trials, the materials were adapted, before they were widely distributed.

The materials developed by RCE Bangalore focuses primarily on personal health and hygiene practices; water-sanitation situations in the immediate environment and the school; and appropriate ways to wash hands, use the toilet, handle and purify water. These are all amply illustrated together with games and poems. As materials

were published in the local language, students received a good understanding on the importance of health and hygiene. The State Education Department printed the IEC materials and distributed them to all schools in the State.
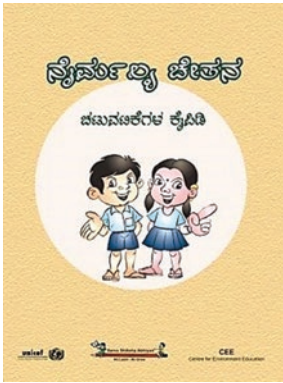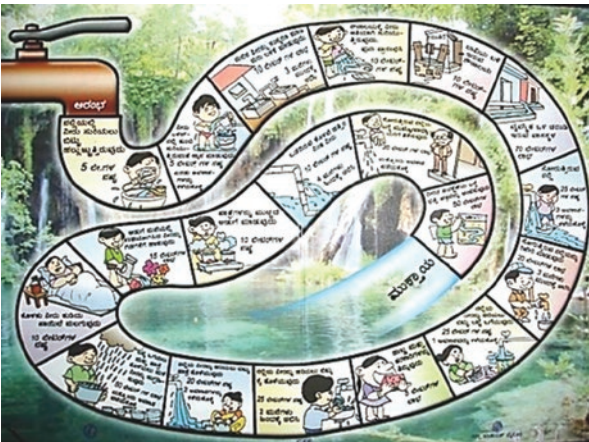
Images of Educational Materials
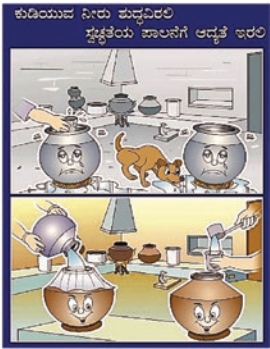
Posters on personal hygiene.
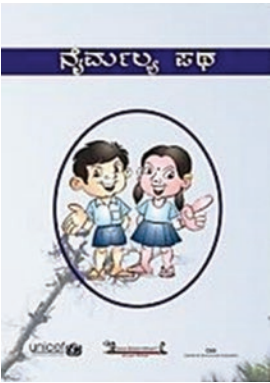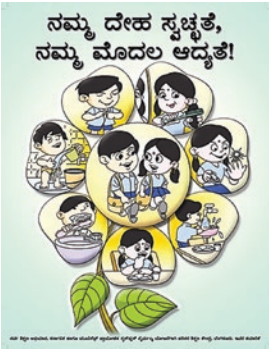
Pocket booklet on personal hygiene.


Activity booklet for students on sanitation.

Game chart.

Orientation and Capacity Building
Over seven years, in collaboration with UNICEF and the State Education Department, RCE Bangalore has worked in more than 22 districts of Karnataka state on school sanitation and hygiene, covering more than 11.8% of the schools in the state. To date, more than 50,000 students have been reached, an average of 30 students per school, on WASH issues, including menstrual hygiene among adolescent girls.

The overall reach by RCE Bangalore in Karnataka.
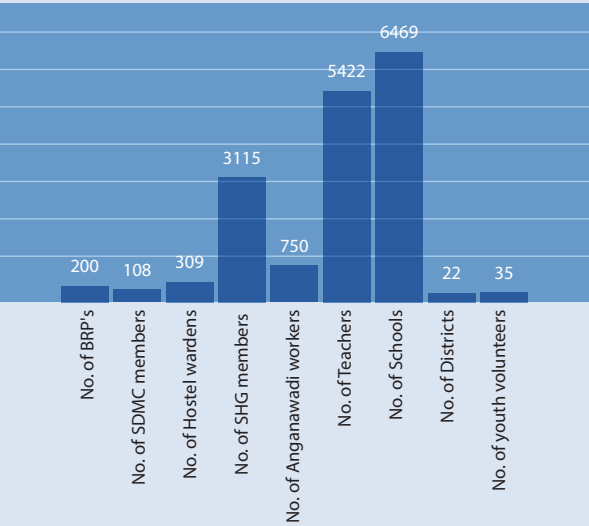
Follow Up and Evaluation
A format was developed for evaluation of the programme. For every cluster of schools, the Cluster Resource Coordinator (CRC) assessed the schools and their WASH initiatives. The CRCs forwarded their observations to the State Education Department. CEE was engaged in the analysis of data and the observations of the CRC.

Advocacy
The Mid-day Meal (MDM) Scheme is a school meal programme of the Government of India, designed to supply free lunches on working days to children in primary and upper primary schools. Understanding the importance of WASH through the RCE programme, the MDM scheme has already built hand-wash stations in 3,000 schools and will build the same in 4,500 more schools in Karnataka. In addition, under this scheme, kitchen sheds will be built in the schools, and efficient maintenance of toilets will be undertaken (*Ministry of Human Resource Development n.d.*).
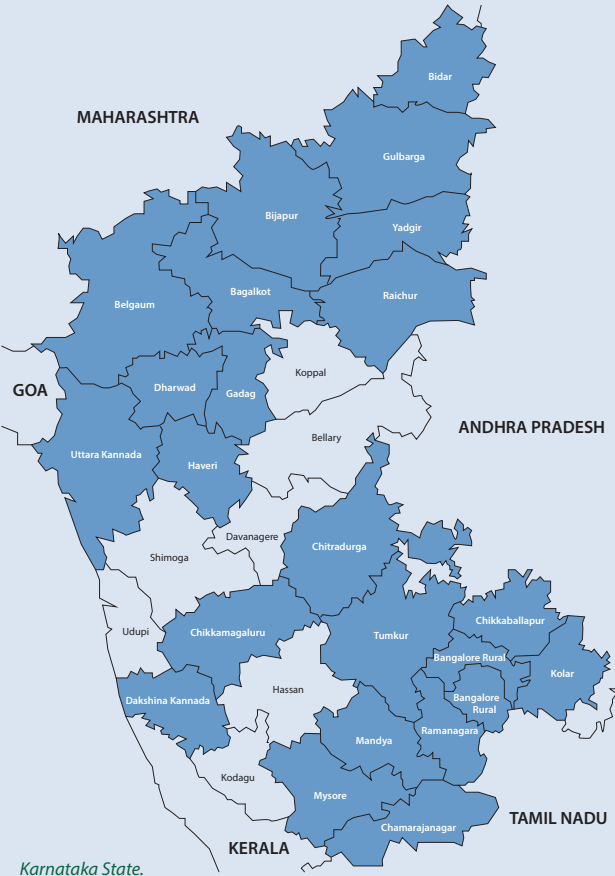
Karnataka State.

Problems Faced During the Programme
The challenges faced during the implementation of the school sanitation and hygiene practices in the state were:

Dirty and Unusable Toilets
Students were encouraged to take part in cleaning the toilets. The SDMC members considered funding the cleaning of toilets.

Opposition from Parents for Involving Students in Usage and Maintenance of Toilets
Given India's cultural concerns with impure tasks and caste purity, teachers and parents initially opposed the move to get the children involved in cleaning the school toilets. It took a lot of time and orientation programmes to make them see toilet cleaning as part of their education.

Nonavailability of Water
Whenever water was unavailable in the toilets, students were encouraged to fetch a bucket of water from the nearest source for hand washing.

Ending Open Defecation

In most rural parts of the country, in the absence of toilets, defecation in the open is common practice. The behavioural change needed to discontinue this practice was immense. The TC CC CP model was followed, with teachers as the agents of change. The importance of hygiene was spread from teacher (T) to the children (C), from one child (C) to another child (C), and finally from the child (C) to the parent (P), thereby reaching the society at large. Continuous follow-up was needed to ensure that the children and the teachers understood the importance of personal hygiene. In the impact study conducted in 55 rural schools in Hubli, which covered almost 1,200 students, 32 children motivated their parents to construct toilets in their respective homes.

Continuous follow-up has been one of the factors that has made a huge impact to the entire programme. Because of the persistent approach, the teachers had to listen to the resource persons. Through orientation programmes, their attitude towards personal hygiene – hand washing in particular – underwent a significant change.

A Small Impact Study

An impact study was done by the students of JSS Engineering College, Mysuru, where RCE Bangalore, with the support from UNICEF, had constructed hand washing units with a water connection in more than 55 rural schools in Solur Hobli near Bangalore, and made them functional. This resulted in a common hand washing practice, using soap, among students. The results have been documented, based on teacher reviews and feedback. Every school has a monitoring chart or a record book to document hand washing practices. Schools also maintain health charts of the students. The data for the study was gathered from these charts too (*Students of JSS Science and Technology University, 2016*).
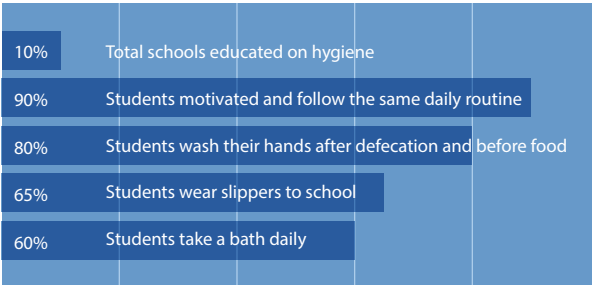
The teachers-in-charge observed the following:

- Hand washing has become a daily routine among children, teachers and the cooks in the Mid-Day Meal kitchens
- Students now had the habit of washing their hands in schools as well as at home with soap at two critical times – before eating and after using the toilet
- SDMC members were inspired by this initiative, and have been providing complete support for construction of hand wash units in more schools

Behaviour Changes

WASH in schools has led to behavioural changes among the children. Now students regularly wash their hands, use the toilets and avoid open defecation, maintain cleanliness in the school campus, and segregate the waste. An estimated 70% of children have been motivated by this programme, and have communicated their learning to their parents. 32 students have even motivated their parents to construct toilets, soak pits and compost pits at their homes. The graph below highlights the behavioural changes seen among the children due to WASH interventions. The data were compiled from sample school surveys, reviews, interactions, and feedback provided by the school teachers.

Seventy percent of children have now learnt the proper use of a toilet. Before using it, they flush the toilet with a mug of water and again after use with two mugs of water. The new students follow the older ones, and learn by observation. A separate study is needed to understand why the remaining 30% are not following the norm (*Students of JSS Science and Technology University, 2016*).

10%	Total schools educated on hygiene
90%	Students motivated and follow the same daily routine
80%	Students wash their hands after defecation and before food
65%	Students wear slippers to school
60%	Students take a bath daily

0   20%   40%   60%   80%   100%

Behavioural changes due to intervention.

Success Story

Tejaswini, a 3rd grade standard student of Hakkinal Government Lower Primary School (GLPS), frequently missed school due to various health issues. She suffered from colds, cough and frequent vomiting spells. Her parents took her to a doctor, but her health did not improve. One day, an RCE member visited the school, and made the school a part of the WASH programme. Orientation sessions were held for teachers, students and SDMC members, and Hygiene Camps were organised in the school. Tejaswini saw her friends washing their hands, and slowly she too started to wash her hands before meals and after using the toilet. Now Tejaswini studies in the Vth grade standard, is healthy and never misses school.

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ENVIRONMENTAL SUSTAINABILITY: THE NEED FOR MULTI-STAKEHOLDER ENGAGEMENT AND LEARNING

Shabana Kazi.

Introduction to the Sanitation Status in Goa

Goa, the smallest Indian state, is located in the south-west peninsular of India, in a region known as the Konkan. It is bounded by the state of Maharashtra to the north, Karnataka to the east and south, and the Arabian Sea lies to its west. The state encompasses an area of 3,702km², and its 101km-long coastline is lined with beaches, which makes Goa a popular tourist destination for both Indian and foreign tourists.

The state has been blessed with good socio-economic indicators, but the inflow of migrant workers is rapidly altering the states' demographics. As per the Census of India 2011, residents of 53,000 (around 20%) households in Goa, do not have a toilet facility available within their residential premises and so they use public toilets, or toilets where the nightsoil is let out into open drains or taken care of by animals, or they defecate in the open (*Times of India, 2013*). Treated tap water for drinking is not available to 28% of the households, and 26% live in houses that are vulnerable to harsh natural conditions. It is important to note that the inclusion of temporary dwellings of migrant workers at construction sites as 'households' in the census data is one of the reasons for the poor sanitation and hygiene indicators in 2011 (*ibid.*).

According to the Ministry of Drinking Water and Sanitation (*http://sbm.gov.in/sbmreport/State.aspx*), 28,637 toilets have been built in Goa since the launch of the Swachh Bharat Mission (Gramin)[1] in October 2014, suggesting an increase of 15.62% in household toilets. Despite the 70% sanitation coverage reported by the 2011 Census for the state, only 18% of the households are connected to the sewerage system, while the majority of the population is dependent on septic tanks and soak pits to dispose of excreta and wastewater. This leads to groundwater, and/or drinking water contamination due to reduced capacity
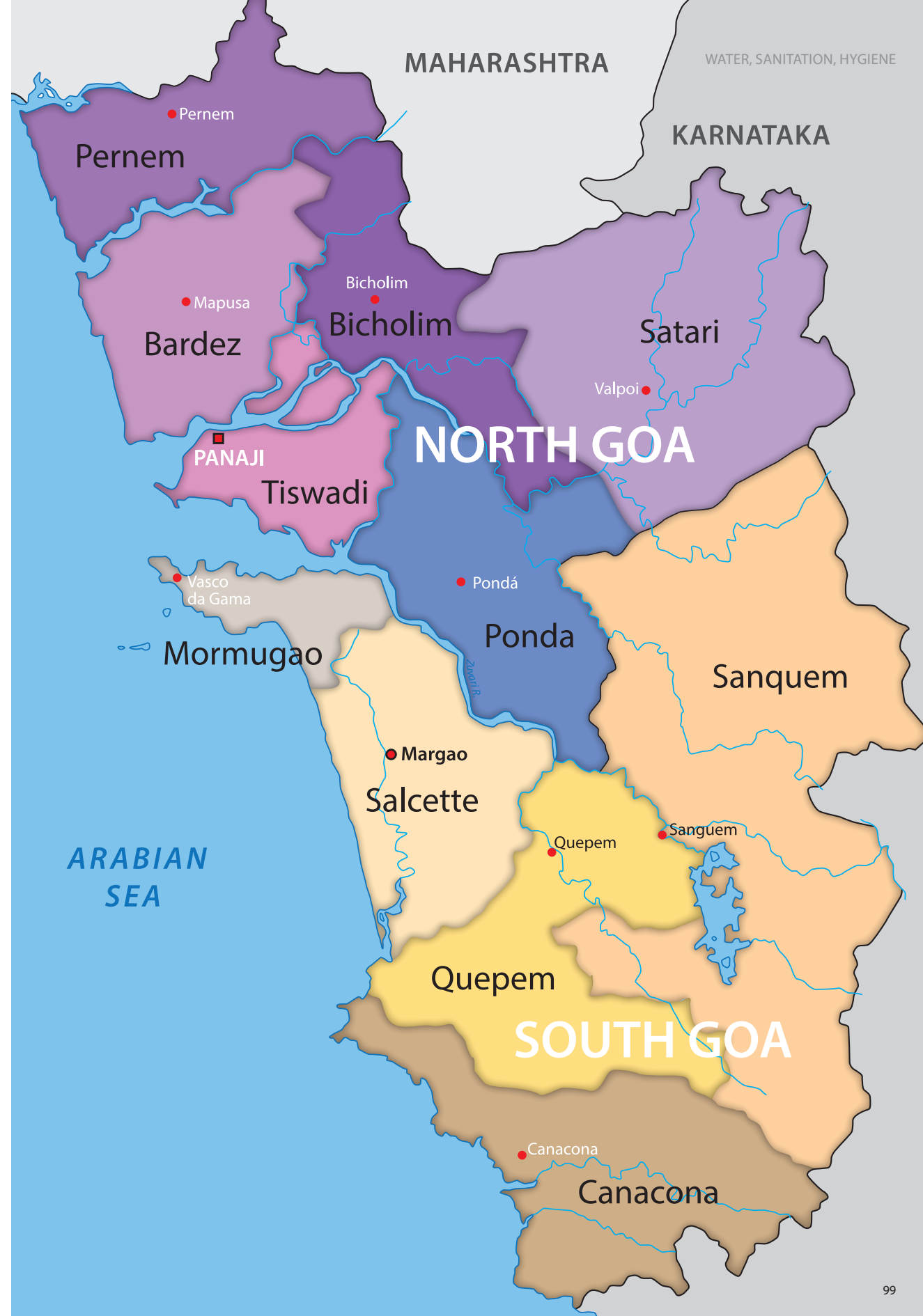
of the soil to absorb waste. Sewage treatment capacity in Goa is only 35.5 MLD as against a generation of 157 MLD of sewage from the domestic sector. With increasing urbanisation and infrastructural development, a lot of sewage water is being let into open drains. Only the major towns, namely Panaji, Margao and Vasco, have an underground sewerage network.

Groundwater resources are overexploited in the mining areas and in a few pockets in the coastal regions of the state. Excessive pumping of water due to open cast mining has depleted the groundwater table severely in the mining areas. The groundwater table is also under severe strain in the North Goa coastal belt, which the Water Resources Department attributes to the development of tourism infrastructure. In April 2012, under Section 4 of the Ground Water Regulation Act, 2002, the entire state was declared as a scheduled area, that is, an area where water cannot be withdrawn without the permission of the government authorities.

With climate change looming, the anticipated rise in temperatures and sea level can also create favourable conditions for disease-bearing vectors, such as mosquitoes, to thrive (for example, conditions caused by the accumulation of warm brackish water in low lying areas). TERI (*2015*) reported 55,545 cases of diseases in Goa attributable to environment-related risks[2], of which 17,961 were diarrhoeal diseases. The study, based on WHO assessments, cites that almost 90% of all reported diarrhoeal diseases could be attributable to poor water quality, sanitation and hygiene. Hence, health-related concerns from poor water quality are one of the key factors related to environmental management and public health. Goa being a tourist destination would have to factor this in while considering public provision of health infrastructure in the state (*ibid.*).

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[1] Swachh Bharat Mission (SBM), launched on 2 October 2014 (also known as the Swachh Bharat Abhiyan), is a national campaign to achieve universal sanitation in the country by 2019. It was previously known as the "Nirmal Bharat Abhiyan" and before that the "Total Sanitation Campaign" (a programme following the principles of community-led total sanitation (CLTS) initiated by the Government of India in 1999). It consists of two sub-missions; SBM-Gramin (i.e. Rural), and SBM-Urban.

[2] Environmental risk here implies 'actual/potential threat of adverse effects on the environment (living and non-living components) due to effluents, emissions, wastes, resource depletion etc.'

KARNATAKA

Pernem

Pernem

Bicholim

Mapusa

Bicholim

Satari

Bardez

Valpoi

PANAJI

NORTH GOA

Tiswadi

Vasco
da Gama

Pondá

Mormugao

Ponda

Sanquem

Margao

Salcette

Quepem

Sanguem

ARABIAN
SEA

Quepem

SOUTH GOA

Canacona

Canacona

Education and Sustainability

Education, especially in schools, can play a significant role in sensitising and contextualising problems related to Water, Sanitation and Hygiene (WASH) in a simple and demonstrative manner. It also builds capacity to find potential solutions to address the various challenges and issues in the area of WASH. Hygiene education when coupled with appropriate sanitation facilities at school helps mould student behaviour and develops skills that they are most likely to retain as adults. It also contributes to making them effective messengers and agents of change within their families and local communities of which they are a part.

Education for Sustainable Development (ESD), by bringing in concepts and methodologies from various disciplines, helps provide holistic solutions to the multi-faceted issues and challenges related to WASH that generally cut across the sociocultural, environmental and economic domains within society. The UN's Sustainable Development Goals (SDGs) aim to reduce poverty and improve environmental sustainability. In particular, Target 4.7 of SDG 4 (on Education) focuses on Global Citizenship Education (GCED) and Education for Sustainable Development (ESD), and is considered instrumental for achieving the success of all other 17 SDGs. ESD thus has an important role to play as it will provide learning goals to help achieve the SDGs, and will also build capacities of all development partners and stakeholders involved in the process.

Intervention by RCE Goa

RCE Goa, part of the global network of Regional Centres of Expertise in ESD, was set up in 2012. It envisages facilitating collaborative research, development and promotion of ESD in Goa, and adopts an 'awareness, outreach and dissemination' approach primarily targeting youth in the region so as to help address the various regional sustainable development challenges. RCE Goa possesses the necessary tools and techniques to address WASH challenges, as it not only strategises a cross-cutting approach through the various domains, but also brings all ESD actors on a single platform to collectively address the water, sanitation and hygiene problems and issues in the region.
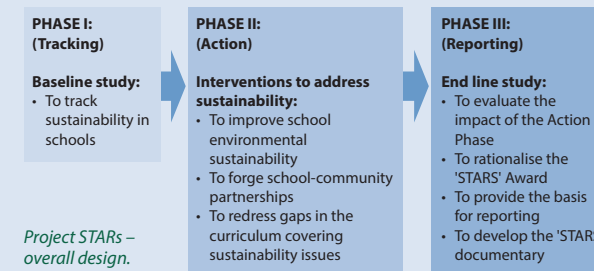
The Energy and Resources Institute (TERI), being the secretariat of RCE Goa, coordinates the overall activities of RCE Goa. Some of the RCE partners are Goa University, Dempo Charities Trust, Bal Bhavan, Directorate of Education, Goa Science Centre, WWF, the International Centre Goa, Travel and Tourism Association of Goa, Goa Chamber of Commerce and Industry, Free Legal Aid Cell, and the Navhind Papers and Publications.

One of the major projects executed by RCE Goa was project STARs (Sustainability Tracking, Action and Reporting in Schools), an education-cum-action project on sustainable schools. A sustainable school encapsulates the ESD principles through the adoption of 3Cs, namely,

Ms. Pallavi Dempo, Executive Director, Dempo Industries Pvt.Ltd, inaugurating the sanitation block at St. Bartholomew's School, Chorao, Goa, India.

improving campus efficiency, integrating ESD into the curriculum, and developing community partnerships in order to strive towards sustainable development. The project was undertaken in collaboration with the Dempo group of companies – a forward-looking conglomerate based in the region, which pioneered industrialisation in Goa in 1961 after the States' integration into India. The group has a three-century-long history of trading and a long history of social responsibility.
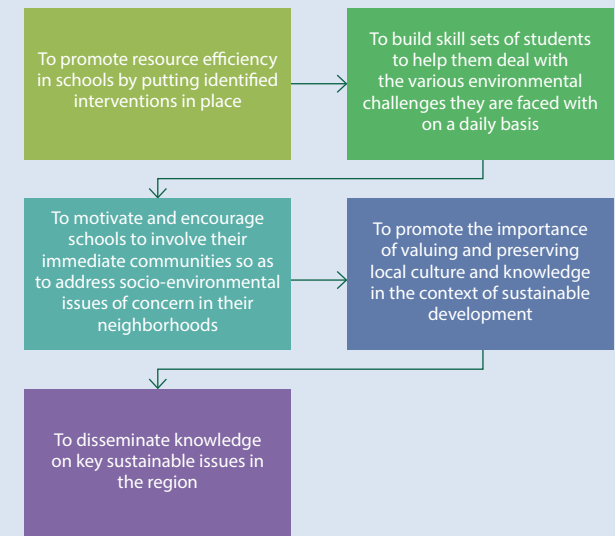
Project STARs aimed to inspire and encourage schools to practice the principles of sustainability by focusing on environmental and social performance, both tied together with a strong local cultural thread. The project worked with ten schools spread across the region on improving resource efficiency by putting identified hardware interventions in place, conducting sensitisation sessions and field visits, and developing resource material. Schools also engaged with their surrounding communities by executing various socio-environmental campaigns and documented the history and culture of their immediate neighbourhoods.

The project was done in three phases: Tracking, Action and Reporting on Sustainability. In the first phase, a baseline study was undertaken to study and analyse the schools' sustainability performance. In the second phase, action was taken to address the gaps found in the baseline study. In the third phase, an end-of-line study was conducted to understand and evaluate the impacts resulting from the action phase. A documentary on the project work was also developed presenting the work undertaken in the various project schools. The diagram below summarises the project.

PHASE I: (Tracking)

Baseline study:
- To track sustainability in schools

PHASE II: (Action)

Interventions to address sustainability:
- To improve school environmental sustainability
- To forge school-community partnerships
- To redress gaps in the curriculum covering sustainability issues

PHASE III: (Reporting)

End line study:
- To evaluate the impact of the Action Phase
- To rationalise the 'STARS' Award
- To provide the basis for reporting
- To develop the 'STARS' documentary

Project STARs – overall design.

The importance of sanitation and hygiene being communicated to the students of St. Bartholomew's School, Chorao, Goa, India.

The specific objectives of the project were:

To promote resource efficiency in schools by putting identified interventions in place

To build skill sets of students to help them deal with the various environmental challenges they are faced with on a daily basis

To motivate and encourage schools to involve their immediate communities so as to address socio-environmental issues of concern in their neighborhoods

To promote the importance of valuing and preserving local culture and knowledge in the context of sustainable development

To disseminate knowledge on key sustainable issues in the region

Project STARs: Specific objectives.

Baseline assessments carried out initially revealed certain gaps that needed to be addressed in each of the ten schools. Each schools' performance in all three domains, environmental, social and cultural, was assessed through structured and non-structured questionnaires and key informant interviews. Key parameters analysed were:

Environmental
- *Energy:* consumption, use of energy-efficient devices/ renewable energy sources
- *Water:* consumption, water conservation efforts, wastewater recycling and disposal practices
- *Solid waste:* generation, disposal, recycling and composting
- Sustainable transport options
- Presence of green cover, local flora and fauna etc.

Sociocultural
- Linkages with local NGOs and other organisations
- Partnerships with local communities addressing social issues
- Raising various social issues in school and community through different forums
- Importance of local/indigenous culture in natural resource management, knowledge and conservation of sacred groves and rivers, knowledge about heritage sites and buildings in their vicinity, etc.

To improve the environmental sustainability of the ten selected schools, the project intervened in the areas of energy conservation and waste management in nine of the ten schools. In the tenth school, St. Bartholomew's High School, it intervened specifically to help improve the sanitation facility in the school so as to provide its students with a sustainable and healthy learning environment. St. Bartholomew's, located in Chorao village, an island in the Tiswadi taluka of North Goa district, did not have a separate toilet block for the kindergarten section. This section was dependent on the primary section toilet block, causing a lot of inconvenience to the young children who had to walk all the way to the primary block to relieve themselves. When it rained, the young students would get wet, and at times, they could not control their bladder till they reached the toilet. To address these issues and ensure better sanitation and hygiene practices in the school, an independent toilet block was built for this section of the school.

Sanitation facility at St. Bartholomew's High School, Chorao Island, North Goa, India (Photo credit: TERI, Goa).

A few other factors that influenced implementation were relevant from the point of view of policy and governance, school support and participation, and the available budget to construct the sanitation facility. The project is very much in sync with the Governments' on-going Swachh Bharat Mission (Clean India Mission). Two toilets, (one each for the boys and girls separately), were constructed and fitted with traditional gravity-flush toilets, and a septic tank to ensure proper disposal of the sewage. Ceramic sinks were also installed in the toilets to facilitate hand-washing. To ensure that these facilities were used properly and effectively, students needed to be made aware of how to use and maintain the facility. Water shortage, too, could affect the maintenance and usage of the sanitation facility. In light of these constraining factors, a workshop on WASH (water, sanitation and hygiene) was conducted for the students and teachers of the school. An interactive awareness and sensitisation session highlighting the importance of water, health, sanitation, and maintenance of personal hygiene was conducted. The workshop comprised two modules, one covered the importance of water and its conservation, the other discussed sanitation and hygiene. Students also undertook a WASH campaign in the school and the surrounding community to drive home the message of water, sanitation and hygiene.

Relevance to Policy at the National and International Level

Project STARs was aligned to UNESCO's Global Action Programme (GAP) on Education for Sustainable Development (ESD), which seeks to generate and scale-up concrete actions in ESD. It directly addresses Priority Action Area (PAA) 2 (Transforming learning and training environments – integrate sustainability principles into education and training settings), PAA 3 (Building capacities of educators and trainers – increase the capacities of educators and trainers to more effectively deliver ESD), PAA 4 (Empowering and mobilising youth – multiply ESD actions among youth) and PAA 5 (Accelerating sustainable solutions at local level – at community level, scale up ESD programmes and multi-stakeholder ESD networks).

The project has integrated sustainability principles into the school settings by not only practicing the same but also empowering students to carry the efforts forward to bring about a transformative change. The various school-led campaigns and outreach initiatives in the community have raised the need to arrive at sustainable solutions to various environmental challenges and sociocultural issues of concern in the region. Through the project's training component and under its social pillar, teachers were also trained on improving their core competencies as educators.

The project has also worked to address the SDGs, which reiterate that education is not only an end in itself, but also a means to achieving a broad global development agenda. The sanitation facility that was built directly fits into Goal 6, which seeks the availability and sustainable management of water and sanitation. It also addressed SDG 7, which is to ensure access to affordable, reliable, sustainable, and modern energy, through its Light Emitting Diode (LED) initiative at four of its member schools.

Furthermore, the Swachh Bharat Mission (SBM) is a national campaign of the Government of India, to clean the streets, roads and sanitation infrastructure of the country. The WASH-related interventions (to improve waste management, sanitation and hygiene) are in sync with the SBM and are aligned to its goal of achieving a Swachh Bharat (Clean India) by 2019.

Photo credit: TERI, Goa

The newly constructed sanitation facility at St. Bartholomew's School, Chorao, Goa, India.

Outcomes and Achievements

STARs methodology not only highlighted the prevailing issues through the baseline assessment, but also addressed them holistically using hardware and software interventions, by adopting a three-pronged approach of campus improvement, curriculum intervention and community engagement for a diverse stakeholder group (students, teachers, parents and the community) within each project school. The sanitation intervention of STARs highlighted the related issues of water, sanitation, health and hygiene and addressed them in the holistic manner outlined above in the school identified for the WASH intervention. The toilet block built under the hardware component helped in improving the sanitation and hygiene status within the school campus, and was complemented with software interventions in the nature of workshops, supplementary resource material that teachers could use as teaching reference points in class, and also facilitated awareness on WASH-related issues through school assembly sessions, and campaigns for the whole school and the neighbourhood community.

The project has been instrumental in improving resource efficiency at the schools. Energy and water consumption has been going down and better waste recycling rates have been achieved. In particular, solid waste and WASH-related concerns have been addressed successfully in the two project schools where a composting and a sanitation facility have been built.

Some of the key outcomes of the project, particularly with respect to WASH, are as follows:

- The sanitation facility is currently serving the kindergarten section comprising nearly 100 students
- Feedback from all schools indicated a strong positive response indicating an impact on student knowledge, attitude and action
- Established and/or strengthened school-community linkages across various sustainability domains
- Increased sensitivity to sociocultural issues and enhanced awareness about local culture and knowledge in the project schools

Conclusions

The sanitation facility is in operation and is serving the kindergarten section of St. Bartholomew's school. The critical message of hand washing, sanitation and personal hygiene was also reinforced through student-led campaigns in and around the school. The school undertakes regular maintenance of the facility and has reported that it is serving the young students very well as they no longer have to walk a distance to use a toilet. The school management and staff also feel that the facility has greatly helped the students and the school in terms of working towards a Swachh Bharat.

Overall, the project has established how a programme that engages educational institutes, can be a catalyst for sustainable development by demonstrating the principles of sustainability in practice. The project has enabled participants to improve their campus operations, engage local communities and integrate learning for sustainability and sustainability practices in their context. The interventions have been successfully implemented at the school where multi-stakeholder networking and collaboration have played a crucial role.

Changed patterns of engagement and the associated knowledge sharing among all the stakeholders will ensure that the agenda of environmental sustainability in terms of WASH-related issues is carried forward, and will hence facilitate transformative learning in the school community and beyond. The project could be up-scaled by designing and establishing all related hardware interventions to improve resource efficiency and waste management at one school in totality. Schools showing significant resource savings and willing to take forward community engagement and curriculum interventions could be adopted as individual sustainable school models for further work and as inspiration for others. Furthermore, the project strongly recommends the formulation of an ESD policy at the local and national level.

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RURAL SANITATION AND 'OPEN DEFECATION FREE' ENVIRONMENT

Riyas Ahmed Mir, Rashmi Gangwar and Abdhesh Kumar Gangwar.

Open Defecation Free (ODF) is defined as the termination of the oral faecal transmission with no visible traces of faeces found in the open environment and safe options for its disposal (*Government of India (GoI), 2015*). At the time of India's independence in 1947, only 1% of households in rural India had access to sanitation facilities. In 1954, the GoI introduced the rural sanitation programme as a part of the country's First Five Year Plan. However, 60 years later, The Millennium Development Goals (MDGs) India Country Report 2014 stated that Goal 7 (ensure environmental sustainability) is on track on all indicators except on basic sanitation (*GoI, 2014*).

According to the World Health Organization/United Nations Children's Fund (*WHO/UNICEF, 2015*) joint monitoring programme (JMP) for water supply and sanitation, over the last 25 years India has succeeded in reducing open defecation from 75% of households (in 1990) to 44 % (in 2015).

JMP – estimated trends of sanitation coverage						
India	Sanitation Coverage Estimates					
	Urban (%)		Rural (%)		Total (%)	
	1990	2015	1990	2015	1990	2015
Improved Facilities	49	63	6	28	17	40
Shared Facilities	16	21	1	5	5	10
Unimproved	6	6	2	6	3	6
Open Defecation	29	10	91	61	75	44

Source: WHO/UNICEF JMP, 2015.

The Sanitation Problem

Inadequate water and sanitation infrastructure and unhygienic practices facilitate the transmission of pathogens that cause diarrhoea, which accounts for 2 million child deaths annually in the world, about half of them in India. Open defecation results in water-borne diseases, such as acute diarrhoea that is responsible for high morbidity and mortality among all age groups. Repeated incidence of diarrhoea due to poor sanitation,

improper disposal of human and animal excreta, lack of hand washing after defection and before eating food, and the use of unsafe drinking water severely affects both physical and cognitive development of children. In India alone more than 1.7 million children aged below five years died in 2010, with diarrhoea being responsible for more than 13% of deaths (*UNICEF, 2012*).

UNICEF reports that in India, 48% of children below five years of age are stunted, resulting most often from malnutrition and poor sanitation. Stunting is associated with an underdeveloped brain, with long-lasting harmful consequences, including diminished mental ability and learning capacity, and poor performance continuing into adulthood (*http://unicef.in/Whatwedo/10/Stunting*).

Women are another group seriously affected by poor sanitation. Poor access to sanitation facilities and poor sanitation conditions can influence women's physiological and mental health. In response to the shame and fear associated with open defecation (OD), women restrict their movements and discipline their bodies so that the need to defecate does not come at inconvenient or unacceptable times. This leads to severe and serious ailments. Recent studies also show a relationship between unsafe sanitation and violence against women. These include sexual violence including rapes, killings, assaults, harassment and a general feeling of insecurity while commuting to and from the defecation sites that are in open fields outside the village. Attacks by wild animals, snakebites, and scorpion stings are other threats (*Lennon, 2011; McCarthy, 2014, WaterAid*).

Has it ever pained us that our mothers and sisters have to defecate in the open? Poor womenfolk of the village wait for the night; until darkness descends, they can't go out to defecate. What bodily torture they must be feeling, how many diseases that act might engender. Can't we just make arrangements for toilets for the dignity of our mothers and sisters?
Narendra Modi, Prime Minister of India
(Excerpts from the Independence Day address by the Prime Minister on 15 August 2014).

Promoting hand washing with soap at critical times.

Photo credit: CEE

The 17 Sustainable Development Goals (SDGs) have defined targets to be achieved by 2030. SDG Goal 6 is about ensuring the availability and sustainable management of water and sanitation for all, under which universal and equitable access to safe drinking water as well as adequate and equitable sanitation and hygiene for all has to be achieved by 2030. This requires stopping open defecation and paying special attention to the needs of women, girls and those in vulnerable situations.

India launched Swachh Bharat Mission (SBM; in English: Clean India Mission), in 2014 with two sub-missions, SBM (Gramin, i.e. Rural) and SBM (Urban), to combat the challenge of OD. SBM Gramin aims to make Gram Panchayats (GPs or areas under Village Councils) Open Defecation Free, and clean and sanitised through solid and liquid waste management. Extensive guidelines developed for SBM Gramin recognise that availability of water in the villages is an important factor for sustaining the sanitation facilities created. Hence they advocate conjoint programmes at the District and GP levels under the SBM Gramin and the National Rural Drinking Water Programme (NRDWP) on priority, to maximise the availability of water for sanitation purposes. The Government of India is aiming to achieve Open-Defecation Free India by 2 October 2019, the 150th anniversary of the birth of Mahatma Gandhi[1], by constructing 12 million toilets in rural India at a projected cost of US$30 billion. The money has been arranged with a loan from the World Bank.

A major intervention in Rural School Sanitation is on separate toilets, with water supply, for girls and boys, and will be implemented under the programmes of the Department of School Education. Toilets in Anganwadis (early childhood learning centres), will be provided by the Department of Women and Child Development. Children are expected to become sanitation communicators to spread the message of safe sanitation to all. This 'Clean India Clean Schools' Mission shall specifically focus on such a campaign, involving educational institutions in rural areas (*Clean India Clean Schools Mission, 2014*).

If children are convinced through education in schools about the need to have a toilet at home and to keep it clean, their insistence within the family for the facility is expected to lead to toilets being built quite soon in every household. Their insistence and involvement will also ensure that the toilets constructed are put to use and kept clean. This is doable. Promoting and achieving it is the real challenge and a litmus test for ESD.

Money should not, by and large, be a constraint to constructing a toilet. The non-essential expenses of a household for one year on festivals, entertainment, recreation, gifts, avoidable transportation, communication, drinks and snacks, shopping, weddings etc., would generally be more than the cost of a toilet. Moreover, the government provides a subsidy and soft loans for building toilets.

> When the girl student reaches the age where she realises this lack of female toilets in the school, she leaves her education midway. As they leave their education midway they remain uneducated. Our daughters must also get equal chance to quality education. After 60 years of independence there should have been separate toilets for girl students in every school. But for the past 60 years they could not provide separate toilets to girls and as a result the female students had to leave their education midway.
> **Narendra Modi, Prime Minister of India**
> *(Excerpts from the Independence Day address by the Prime Minister on 15 August 2014).*

More than 45 million household toilets have been constructed in India since October 2014 as per the Government of India reports on SBM (Gramin) website (*http://sbm.gov.in/sbmdashboard/*), but the lack of infrastructure is not the only cause for OD in the country. Behaviour, practices and mind-sets are a bigger challenge to be addressed to achieve ODF status. Despite evidence that separate toilets in schools facilitate the attendance and retention of girls in school, the progress of provision of separate toilets in schools has been very slow in the last decade. Anganwadis, especially, have been the most neglected in terms of sanitation coverage (*UNICEF, 2014*).

The Role of RCE Srinagar

RCE Srinagar has been promoting Education for Sustainable Development (ESD) across the Indian Himalayan Region, the northern-most part of India consisting of 12 States and 121 districts. Its vision is to bring improvement in the quality of environment and life of the mountain people through introducing sustainable practices. Understanding that OD leads to so many serious problems, RCE Srinagar attempted a project aimed at achieving an ODF environment. Throughout the project the intention was to understand why it is so difficult to become ODF and how the challenges can be overcome. The study and its findings are presented on the next page.

Interventions in Balrampur

Taking up the challenge, CEE Himalaya with assistance from RCE Srinagar and financial support from UNICEF, Uttar Pradesh, implemented a project to achieve an ODF environment in ten villages that make up the Khardauri Nyaya Panchayat (NP)[2] in Block Shriduttganj of District Balrampur, in eastern Uttar Pradesh.

The objectives of the project were to:

1. Mobilise the community to demand sanitary services, and to adopt hygiene practices such as the use of toilet, hand washing with soap at critical times, most importantly after defecation and before meals, protection of water source from contamination, using safe drinking water and safe disposal of children's excreta.
2. Bring about behavioural changes in the community for improved water, sanitation and hygiene (WASH) practices by involving school children and teachers.
3. Accelerate the sanitation coverage and usage by building local capacities for toilet demand and supply to achieve an ODF environment.
4. Mobilise community and government resources for sanitary improvement of water sources and build community capacity to sustain cleaner environments around water sources.
5. Establish functional systems for proper usage and maintenance of toilets and drinking water facilities in selected schools.
6. To make the community own the programme by ensuring participation through village-level sanitation committee or other existing platforms.

For Community Led Total Sanitation: the Village Triggering Activity.

The Project Area and Baseline Survey

The project area, located in the flood plain of the Ghaghara and Sarayu rivers, is prone to annual flooding. During the July-September rainy season, the entire area gets water logged. Floods and water logging lead to loss of agriculture, livestock and livelihood sources. Damage to infrastructure, drinking water sources and sanitation become major challenges. During Summer the area is prone to drought, when access to drinking water and water for sanitation become scarce.

A survey conducted by the Nirmal Bharat Abhiyan (NBA) in 2012 had enumerated 2,397 households in the project area (*Swachh Bharat Mission (Gramin), 2012*). CEE, in its baseline survey at the start of the project in September 2014, found 2,472, an increase of 75 households. The NBA survey had recorded 610 toilets of which only 184 were functional. CEE, in its door-to-door survey, found only 283 toilets (*ibid.*). The remaining 327 were 'ghost' or 'missing' toilets.[3]

In the project area most of the schools and Aganwadis did not have functional toilets, that is, toilets with water facilities. Under such circumstances, improving the status of rural sanitation remained a big challenge requiring specific strategies to address key bottlenecks, reflecting on challenges in demand, supply and quality of home and institutional toilets in the villages, especially for socially and economically weaker and vulnerable communities.

Significant Achievements

After CEE and RCE Srinagar's interventions all the 53 toilets made by the government during 2012-13 in three villages, namely, Deveria 25, Gulwariya 20 and Visambherpur 8, which were being used as store rooms, started being used as toilets. Not a single toilet remained unused.

In addition to the 283 toilets available at the start of the project, 190 additional toilets were constructed by the government, taking the total number to 473 by the end of June 2015.

As per the NBA 2012 survey the project area had six Anganwadis, all without toilets, and 17 schools of which eight were without toilets. In its survey, CEE found 12 Anganwadis lacked their own building. All the Anganwadis were functioning from school buildings and depended upon the schools' toilet and drinking water facilities. Of the 14 schools found by CEE all but one had functional toilets. Through UNICEF project interventions, toilets and water facilities in all the schools were made functional, both of which were kept clean and well maintained.

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[2] The project covered 10 villages falling under five Gram Panchayats making one Nyaya Panchayat.
[3] For promoting sanitation, the Government of India gives a subsidy to poor families for toilet construction. The beneficiaries, however, often spend the money for other purposes, but on record it is shown that the toilet has been constructed. Such toilets that exist only on paper are known as ghost or missing toilets.

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[1] Mahatma Gandhi was a great promoter of cleanliness and made cleanliness and sanitation an integral part of the Gandhian way of living. Mahatma Gandhi said, "Sanitation is more important than independence" *http://www.mkgandhi.org/articles/gandhian-thoughts-about-cleanliness.html*. Unfortunately his dream of a clean India has not been realised even after 70 years of India becoming an independent country.

Photo credit: CEE

School children taking pledge for washing hands with soap on the occasion of International Hand Washing Day.

All the six Madrasas (Muslim institutions for religious education) had functional toilets and well maintained drinking water facilities. Madrasas are not included as schools in the government survey; however, the project team found them very important for promoting WASH activities. They maintain good sanitation and hygiene standards. The CEE-RCE-UNICEF project team recognised them as schools imparting good education as well as values, and thus they used Madrasas for promoting hygiene and sanitation practices in the community, with encouraging results.

Village Ishwapur, with 53 households raised the demand for 25 toilets, soon after the start of the CEE-RCE-UNICEF project, and had them constructed by the government. All the 25 toilets were functional and being used. With the success of the 25 toilets, demand for another 28 toilets was raised. However they were not sanctioned because of budget constraints so the households themselves built the 28 toilets. By July 2015 each household had a functional toilet and all the toilets were being properly used. Ishwapur thus became the first ODF village in the project area.

At the start of the project, Galibpur, a village with 138 households, had 60 toilets that had been constructed by the government, and one by a household with their own money. As a result of efforts of the project team, the people themselves constructed the remaining 78 toilets, without government help. Galibpur was the second village to become ODF.

The CEE-RCE-UNICEF interventions also resulted in all the government employees of Khardauri Nyaya Panchayat constructing toilets in their homes.

A campaign in schools led to hand washing with soap at critical times by all the students and teachers of the 14 schools (1,277 students and 22 teachers), 12 Anganwadis (1,360 children and 24 Aganawadi workers) and six Madrasas (1,050 students and 19 teachers).

Significant behaviour change took place among the 14,397 people across the 2,472 households in the project area. This included hand washing with soap, safe and contamination-free storage and use of drinking water, and safe disposal of children's excreta. The people started bathing regularly, wearing clean clothes, maintaining personal hygiene, and keeping the kitchen and home premises clean.

As the water table in the area was quite high, each household had its own shallow hand pump or an open dug well, and were using unsafe water from these sources for drinking and cooking. The area also had 50 India Mark (IM) II community hand pumps, each installed for a cluster of households (15 in Chawibujurg, 16 in Gulwaria, one in Vaibheet, six in Devaria, 10 in Galibpur and two in Viswambarpur). As these hand pumps were at some distance from their homes, the villagers had been using those for water for their cattle, washing, bathing and other purposes. As a result of CEE-RCE-UNICEF project interventions, a majority of the households switched to safe water from the deeper IM II hand pumps for drinking and cooking.

More than 60% of the population in the villages of Sahdeia and Chawaibujurg are Muslim, and most of them are well-to-do. Many of them work in the Gulf countries and earn well. That is why the area is called 'mini Dubai'. Despite being rich, and having big and expensive houses, the households do not have toilets because of the lack of awareness. According to the project team's estimate, more than 600 households could afford a toilet. The team targeted them first and was able to persuade three households in Sahedia and one in Chawaibujurg to do so. The religious leaders are especially well respected among Muslims. If they were to talk about the importance of ODF in their Friday sermons, they could influence the 600 well-off households in getting toilets made.

As a result of UNICEF and RCE Srinagar's nine-month-long intervention, awareness was created on WASH issues among the people and the results have started emerging. Good liaison was made with representatives of the Panchayats as well as government officials at the village, block and district levels. The project efforts also triggered the emergence of more than 50 opinion leaders in NP Khardauri. Identification of opinion leaders and building their capacity is one of the most important steps in mobilising people of the area towards becoming

Photo credit: CEE

Community members writing their pledges on sanitation and hygiene.

ODF. These leaders were from Panchayati Raj (local self-governance) institutions, Anganwadis, religious institutions, schools, active women and other community members. All the 50 opinion leaders were invited to participate in different trainings, workshops, meetings and discussions at the block and village level on ODF and health and sanitation issues to enable them to act as messengers in promoting WASH for achieving ODF villages. They were taken on an exposure trip to Ishapur village that had already become ODF to share experiences and learn from them. The exposure trip proved very useful. People were sensitised and inspired; if other villages that were similar to theirs could achieve this, why couldn't they do it. The exposure trip enhanced the pace of the journey to an ODF environment.

Attempts were made to dovetail ODF initiatives with government schemes such as the Mahatma Gandhi National Rural Employment Guarantee Scheme (MNREGS), SBM, and Village Safai Karmee. Toilets and water facilities in schools and anganwadis could get constructed from the funds that the Gram Pradhans have under other schemes.

Part of the project was to train 30 local masons in the techniques of constructing low-cost latrines. They are now available in the area to construct proper toilets.

Challenges and the Way Forward:
The following key challenges emerged during the course of project execution:

Tackling people's dependence, even of those who are quite well-off, on government subsidy for toilet construction is a big challenge.

Changing the habit of the elderly of defecating in the open is a tough nut to crack; however, the younger generation is quite receptive and easily convinced. Youth are an important stakeholder for the success of SBM. Certain campaigns were created to encourage boys and girls to pledge to have toilets built in their homes before getting married. Interestingly, maulvis and muftis[4] in the states of Haryana, Himachal Pradesh and Punjab have decided not to solemnise marriage in a house without a toilet (*Financial Express February 19, 2017*).

ODF cannot be looked at in isolation. There has to be a massive multi-pronged campaign taking on board all the government departments, institutions and individuals. Panchayati Raj institutions can enforce making the construction and use of a toilet in a home mandatory before a marriage, the issue of a ration card, registration of documents, and a job with MNREGS.

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[4] Muslim priests and legal experts who give rulings on religious matters.

Campaigns to sensitise the general public to the need for collective behaviour change towards sanitation issues, and on the importance of hygiene and sanitation for physical and economic health need to be held on a continuing basis. Proper design of toilets is crucial for sustainability, and people need to become familiar with the operation and maintenance of toilets.

Becoming ODF will have a ripple effect on the community, healthy people, clean environment, prosperity and true well-being. More than money and technology, it requires behaviour change among the citizens, for which Education for Sustainable Development is required the most.

Other than ODF, climate-proofing is also the need of the hour, which the project tried to address in a limited way. Implementing the CEE-UNICEF ODF project helped RCE Srinagar meet its objectives of creating awareness and building local capacities for the eco-sensitive development and reducing anthropogenic pressure on the fragile Himalayan ecosystems. It has also helped in fulfilling the long-term goal of RCE Srinagar of establishing partnerships with government, academic institutions, research organisations, community-based organisations and other stakeholders for working together, helping each other and sharing experience for achieving good quality of life.

For the RCEs working in rural areas, as was the situation in this case study of RCE Srinagar, one has to relook at SD. With people defecating in the open, getting ill, children dying, remaining stunted, and being malnourished, people are living in conditions of poverty and poor sanitation, with access only to unsafe drinking water. ESD should start with first improving the quality of life of the people and then moving to address other concerns. RCEs must include this concern in their mandates.

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Promoting hand washing with soap at critical times.

Photo credit: CEE

FOOD EDUCATION:
CREIAS-OESTE'S CRUSADE FOR A NEW FOOD PARADIGM

Alexandra Azevedo.

About RCE CREIAS-Oeste

The RCE was acknowledged in 2007. The main stakeholders are: Universities (ESTM / IPL – Escola Superior de Turismo e Tecnologia do Mar / Instituto Politécnico de Leiria in Peniche and FCT-UNL – Faculdade de Ciências e Tecnologia-Universidade Nova de Lisboa), the municipalities of Cadaval, Bombarral, Lourinhã, Peniche e Torres Vedras, number of schools (ESCO – Escola de Serviços e Comércio do Oeste, High School Henriques Nogueira of Torres Vedras and from Peniche, Bombarral Grouping schools), NGOs (MPI–Pro Information for Citizenship and Environment Movement), Lourambi, Fundação João XXI / Casa do Oeste), cooperatives (Ceifacoop, Louricoop), Farmers associations professionals (APAS – Associação de Produtores Agrícolas da Sobrena, COTHN – Centro Operativo e Tecnológico Hortofrutícola Nacional), and businesses (Ecominhocas, Biofrade).

Some Characteristics of the Region Oeste

Food Production and Consumption
In the region where the RCE operates (*Region Oeste, see map*) the collection of edible wild plants and seaweed has a long tradition, but is practically extinct. The current food production and supply sectors have a high socio-economic impact, but they also face the following limitations:

- Fishing is restricted due to the decline of fish stocks (*Gascuel et al., 2016*) and limitations on fishing effort imposed by national and European Union regulations;
- Horticulture and fruit growing with organic production being minimal – estimated at around 2%; and
- Livestock farming, particularly industrial poultry and pig breeding, face constant challenges of competition from international animal products and from the conditions set for the import of raw materials for food (*INE, 2017*).

Health Data
The cancer rate in region Oeste is one of the highest in the country (*see figure 1*). The percentage of deaths from non-communicable diseases (NCDs) is increasing, both globally and in Portugal. Globally NCDs are estimated to account for 70% of deaths in 2015 (*WHO, 2017*). In Portugal, it is estimated that 86% of all deaths are NCDs related, the leading causes being: cardiovascular diseases (32%), cancer (28%), respiratory diseases (6%), and diabetes (5%). (*see Figure 2 on the next page*). It is well known that poor eating habits and a sedentary lifestyle are related to these risk factors. In 2013, the following NCDs were responsible for more than half the deaths in the region Oeste: cardiovascular diseases (23%), cancers (23%), respiratory diseases (2%), and diabetes (5%) (*INE, 2017*).
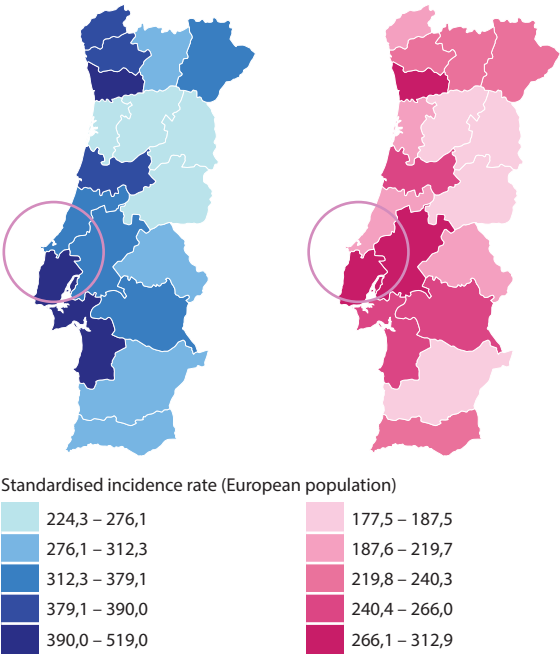

Standardised incidence rate (European population)

224,3 – 276,1	177,5 – 187,5
276,1 – 312,3	187,6 – 219,7
312,3 – 379,1	219,8 – 240,3
379,1 – 390,0	240,4 – 266,0
390,0 – 519,0	266,1 – 312,9

Figure 1: Map of Portugal showing cancer incidence in males (blue) and females (pink) and location of the region Oeste (circled). Source: IPO, 2007.

PORTUGAL

Oeste Region

Percentage of population living in urban areas: 61%
Population proportion between ages 30 and 70 years: 54.8%
Proportional mortality (% of total deaths, all ages, both sexes)
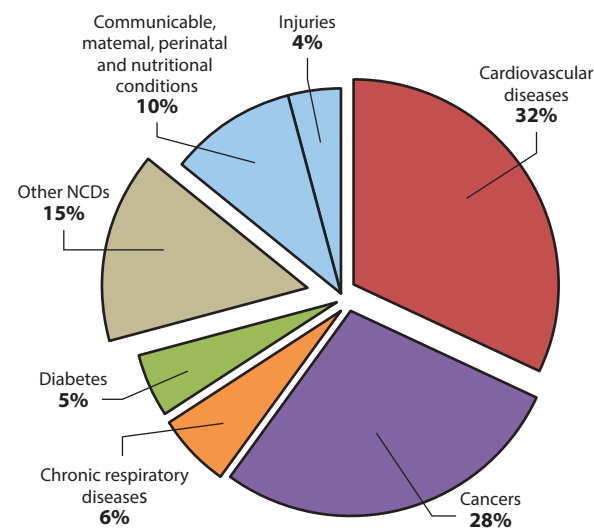
Total deaths: 97,000
NCDs are estimated to account for 86% of total deaths

Figure 2: Profile of deaths due to noncommunicable diseases in Portugal (WHO, 2015).

## Glyphosate Contamination in the Portuguese Population

A study conducted in 2016 by the Portuguese "No GMO Coalition", in cooperation with the Detox Project (*www.detoxproject.org*) found staggering levels of the herbicide glyphosate in the Portuguese population. Urine analysis was carried out to test for this contaminant for the first time in the country (*see Figure 3*).

Glyphosate was detected in 100% of the urine samples from 26 volunteers. The concentration values varied between 12.5 and 32.5 ng/ml (nanograms per millilitre), with the average value being 26.2 ng/ml. Taking the Water Framework Directive as a reference, which allows no more than 0.1 ng/ml of glyphosate in tap water, the result is 260 times above the maximum legal limit. 22 of the volunteers were urban dwellers with no professional exposure.

These results have caused a public alert among the Portuguese. The incidence of glyphosate contamination is widespread, and many populations show high contamination – for example in the United States of America (*Honeycutt and Rowlands, 2014*) and in 18 European countries: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, France, Georgia, Germany, Hungary, Latvia, Poland, Macedonia, Malta, Netherlands,

Spain, Switzerland and United Kingdom (*Brändli and Reinacher, 2012; Medical Laboratory Bremen, 2013*). However, the Portuguese situation is exceptionally alarming (*PTF, 2016*). The Portuguese case highlights that contamination incurred not only as environmental contamination and from imported food and feed (Genetically Modified crops, which have a high tolerance of this herbicide, and are not allowed in EU countries). It showed that sources can also come from careless use of this pesticide in the areas such as in agriculture, and public areas (public green areas, sidewalks, berms and slopes of roads), with these careless practices having been denounced to several NGOs such as PTF and Quercus.

Glyphosate Levels in the Human Body
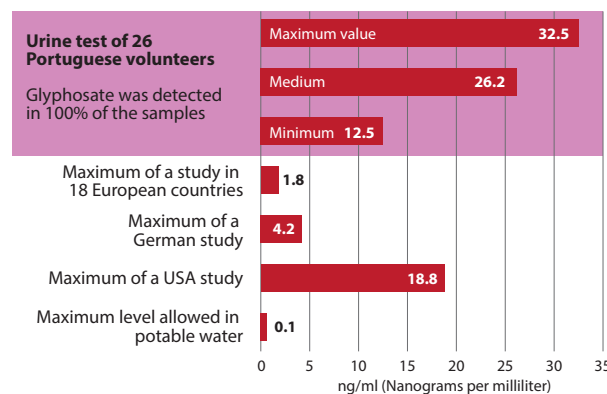
Probable **Carcinogenic Herbicide** according to WHO.

www.stopogm.net
www.detoxproject.org

Figure 3: Glyphosate levels found in a sample of the Portuguese population; and comparison with results from 18 other European countries, Germany and USA. (Source: Portuguese No GMO Coalition, 2016).

Global Framework for Food Issues

For thousands of years, the basic principles of food production and consumption did not change much, but with the Industrial Revolution in the 18th century, and after World War II, a radical change occurred globally. The region Oeste of Portugal, the intervention area of RCE CREIAS-Oeste, was no exception.

The apparent success of what we call "modern" agriculture is in fact illusory. We now have a poorer and less varied diet (*Costas, 2013; FAO, 2004*). More traditional diets have been replaced by the so-called Western diet. This standardised diet is characterised by high consumption of meat and other animal protein, and industrially processed products (such as refined and extruded products, which Michael

Pollan (*2008*) calls "edible food-like substances"), and reduced fruit and vegetable consumption. In practice, the Western diet is based on cereals, supplemented with soybean (mostly transgenic)[1] (*ISAAA, 2016*). These are consumed both directly, in the form of wheat and rice, or indirectly, such as maize, which is the most commonly used cereal in livestock feed (*FAO, 2002*).

The traditional diet of the Oeste region is the Mediterranean diet with an Atlantic influence, which also has changed. The benefits of a Mediterranean diet are known worldwide, especially after UNESCO declared it as an Intangible Cultural Heritage of Humanity on 4 December 2013 (*UNESCO, 2013*).

Addressing food issues is very challenging, as food is linked to many other areas of life. The food choices at a given location, in the current industrial society and globalised trade, are reflected in and influenced by other parts of the world.

The food sector, in particular livestock farming, is one of the sectors with the greatest environmental impact: biodiversity loss (due to deforestation to gain arable land), soil fertility loss, increased water consumption and pollution (nitrates, pesticides, livestock waste) (*FAO, 2006; Goodland and Anhang, 2009; UNEP, 2010*). It is even considered to be one of the main causes of climate change (*FAO, 2006; Goodland and Anhang, 2009*).

Pesticide use, and the consequent food contamination are of great concern. In fact, according to a 2015 pesticide residues report of the European Food Safety Authority (EFSA) published on 11 April 2017, 44% of all European food was tested positively for pesticide residues; in fact, 28% of the food was even tested positively for multiple pesticide residues (*EFSA, 2017*) – the famous pesticide cocktail, for which there is no known research on the effects on human health (*see Figure 4*).

Concern among the scientific community is growing steadily, as researchers at the University of York discovered for the first time that toxicants interact, even if exposure is days apart and the toxicants have a different chemical make-up, resulting in a build-up of toxicodynamic damage in organisms (*University of York, 2017*).

Despite 53.3% of the samples tested being free of quantifiable residues, it is well known that pesticides, especially with endocrine disrupting action, can cause serious effects, even at very low doses. For instance, the most widely used pesticide, glyphosate, causes toxic effects even in doses 500 to 1000 times lower than those prevalent in agricultural use (*Benachour and Séralini, 2009*).

Figure 4: Percentage of EU samples with multiple residues (EFSA, 2017).

In addition to causing biodiversity loss in general, industrial agriculture has led to agro-biodiversity loss. Seeds, the guarantors of new crops, have always been in the possession of the farming population; now they are part of an oligopoly of big agribusiness companies. Because traditional varieties are better adapted to soil and climate conditions of the regions, they are the ones that can best respond to the challenges posed by climate change, and therefore ensure food production in the future (*ETC Group, 2008*). Portugal is one of the most vulnerable countries to climate change, because its entire territory suffers from drought, and 74% of the country suffers from extreme drought (*ibid.*).

Methodology

Several RCE CREIAS-Oeste stakeholders have independently implemented education programmes for health, healthy eating habits, and sustainable production and consumption. Within the framework of RCE CREIAS-Oeste, the challenge has been to improve cooperation and enrich education curricula with food issues.

The methodology implemented includes a regular information update and bibliographic research of diverse contexts, namely scientific studies, news, reports from official entities (such as FAO, WHO, EFSA), NGO reports and press releases, national statistics and the publication of books on food issues. Another important approach is to promote a better understanding among the public about the different activities in the area of food by the various stakeholders. With this basic work RCE CREIAS-Oeste links collaboration and cooperation through its activities, and designs new projects, with the goal of improving communication, and attracting the attention and interest of different audiences more effectively.

[1] In 2014, about 82% of the world's soy bean crop was transgenic (*ISAAA, 2016*).

Steps for a New Food Paradigm

Based on new facts and scientific data, many questions have arisen that request for solutions:

- With the planet and our health so threatened, what can we do?
- What are the alternatives to the dominant model of industrialised food production and diet?

To take steps towards sustainable development, we need to rethink existing models, so the first step must be a "step back" approach from business as usual. Agro-ecological production based on a social and solidarity economy, valuing people and local products, including wild foods[2], makes sense in the new equation. But perhaps many are wondering: Can collection of wild foods meet the food needs of today?

Paradoxically the answer is yes. The gradual introduction of wild and neglected foods, adjusting them to the current diet and territory features, would allow local resources, including indigenous forest, to recover – and subsequently also soil, water and biodiversity, and therefore reduce the negative impacts of food production in the future (*Costas, 2013*).

The challenge is to value and reintegrate local food resources and traditional diet into everyday life. As a majority of the population lives in cities, access to wild foods will have to be made through the market; fortunately, although slow, a market for these products is emerging in Portugal. Wild herbs and berries are beginning to appear in organic farmers' markets, as are products from acorn flour such as bread, snacks and cakes (*Terrius, 2017 and Herdade do Freixo, 2017*).

The southern European region, which includes Portugal, has unique soil and climatic conditions to produce foods of excellence. The Mediterranean Region is also one of the most biodiverse regions of the planet with a rich diversity of wild foods. There is much potential to be explored. In fact, acorn, which has exceptional nutritional and medical qualities, was the main food of early human populations that inhabited the regions where the Oak (*Quercus*) dominated the natural vegetation (the entire northern hemisphere, from North America to Japan). So, the adaptation of the human body to that food must be recorded somewhere in our genetic code. However, here we are in the 21st century almost ignorant about its flavours or qualities.

We now know about the superior nutritional and functional qualities of wild foods, allowing us to consciously choose them, whenever possible. Traditionally these foods were consumed especially when there was scarcity of cultivated food. With wild foods or with food grown in the region, we can be creative in cooking by looking for new healthy recipes. In fact, creativity in cooking can be inexhaustible, and specifically aligning tradition to food innovation helps in this process of reintegration.

To achieve the necessary changes, a basic step is education and awareness generation. RCE CREIAS-Oeste has been working on this. The first question the RCE addressed was: How to communicate more effectively to drive the attention and interest of different audiences? Although the task was not easy, the RCE decided that using food itself would be a good communication strategy. In other words, the idea was not to simply inform people about the problems and alternatives but, more importantly, to present gastronomic alternatives, in the form of eco-gastronomic proposals. This way the message would resonate louder, and would lead to designing activities that would awaken curiosity about the nature around us.

Eco-Gastronomy

Eco-gastronomy is a terminology created by Slow Food as a recognition of the strong connections between plate and planet, and the fact that our food choices have a major impact on the health of the environment and society. The three key points of Slow Food's philosophy are:

- **GOOD:** a fresh and flavoursome seasonal diet that satisfies the senses and is part of the local culture
- **CLEAN:** food production and consumption that does not harm the environment, animal welfare or health
- **FAIR:** accessible prices for consumers and fair conditions and pay for small-scale producers

Source: Slow Food https://www.slowfood.com/

Activities in the Eco-Gastronomy

One of RCE CREIAS-Oeste's main activities is related to Eco-Gastronomy, and comes in different formats: workshops, eco-meals, talks, and live cooking. These are offered in different scenarios – classroom sessions, events, street markets, – attracting different audiences (different education levels: basic, high school, university), the general population and teachers. Eco-gastronomy has different food ingredients that need special attention: bread, weeds, berries and other wild fruits (especially acorn), seaweeds,

and, of course, organic ingredients and alternatives to meat and fish. It is important to offer non-vegetarians a wide variety of legumes (chickpeas, beans, and lupine for example) for a protein-rich sustainable vegetarian diet. This calls for the creation of tasty recipes to conquer their taste buds and meet the target of food education.

Activities	Target Group
Eco-Gastronomy workshops	General population, teachers
Seed saving workshop	General population
Awareness sessions	General population, students, teachers
Live cooking	General population
Video series "Edible Nature"	General population

Table 1: Types of activities related to Eco-gastronomy with the respective target groups.

Examples of some activities:

Live cooking at the local producers' market of new recipes to introduce consumers to wild and local products, and to encourage them to integrate these in their regular diet. The other goal is to increase sales, thereby promoting local production and supporting the producers.

Live cooking "Amazing recipes with lupine" in a producer's market.

Seaweed Workshop (From the sea to the table). Seaweeds are a natural wild food that have a high nutritional value but are low in calories. They are rich in vitamins A, B and C, contain easily digestible protein (all essential amino acids), fibres, minerals and trace elements (some of them rare like bromophenols with antioxidant effect) (*Sáa, 2002*). Their wide range of constituents make this wild food a desirable addition to correct nutritional deficiencies of current diets.

This workshop was held once in 2013 and was the result of a collaboration of MPI – Movimento Pró-Informação para a Cidadania e Ambiente and ESTM / IPL – Escola Superior de Tirismo e Tecnologia do Mar / Instituto Politécnico de Leiria (School of Tourism and Maritime Technology of Peniche / Polytechnic Institute of Leiria). The workshop started with involving participants in seaweed observation, followed by cooking of some recipes for lunch, where every dish contained seaweeds. The recipes were borrowed and inspired from all over the world: Japan, Azores (Portugal), Ireland (where the use of pioka or Irish moss[3], Chondrus crispus, is a tradition), Wales (Laver bread) and France. Finally, the facilitators shared experiences and knowledge about seaweed as an important local food resource to be tapped.

Seaweed workshop: seaweed observation and identification.

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[2] Wild foods are food items that have had no management to increase their production.

[3] A species of red algae which grows abundantly along the rocky parts of the Atlantic coast of Europe and North America.

Edible Weeds Workshop. Several editions of this workshop have been held involving different partners, such as NGOs and schools. The activity usually begins with observation and identification of some species of edible weeds. Next, the facilitators and participants cook a few recipes for lunch to make a diverse menu. The workshop ends with sharing of experiences and knowledge about weeds, and their importance as a local food resource.

Edible weeds workshop – weeds observation and identification.

Traditional Bread Workshop. The workshop approaches everything that is important for producing traditional bread: traditional seeds and seed saving, threats from GMOs and hybrid varieties, traditional farming, sourdough processing and its health benefits, handling of a wood oven, and tasting the bread. The workshop emphasises the locals involved, such as the farmer and miller, where participants enjoy a visit. Unfortunately, in the absence of a traditional baker, the author, who makes bread at home the traditional way (though she uses the traditional wood oven only in Winter), takes on that role.

Sourdough

The natural leaven, sourdough, results from a balanced and symbiotic growth of yeasts (Candida milleri) and bacteria (Lactobacilli) that occur naturally on the surface of the grain and consequently on the flour. Bacteria are responsible for a lactic fermentation that gives a slightly acidic flavour to the bread. In addition to the lactic acid, acetic acid, ethanol and carbon dioxide are also produced. The production of cereals organically and grinding them in a stone mill yields a flour that facilitates the development of these bacteria.

The natural process gives a different flavour (some consider it a better flavour), a more humid mass, increased shelf-life, and improves the digestibility of the bread and the bioavailability of nutrients.

The so-called "Baker's yeast" used for baking conventional breads is constituted of a single type of yeast (Saccharomyces cerevisiae), produced industrially. Its fermentation yields carbon and ethanol dioxide, and allows a more fluffy mass, reducing fermentation time.

Sources: Artisan Baker Association, and Exploratorium.

Raising awareness in schools through sustainable cooking workshops. To introduce students to sustainable food products, the RCE organises sustainable cooking workshops in schools. After a theoretical introduction, some recipes are demonstrated. The workshop ends with tasting of the cooked products. At these workshops, everyone always yearns for more time.

Awareness session at High School of Peniche.

Eco-gastronomic contest. A new activity introduced in 2015 was an event organised by students of the High School of Peniche, with other RCE CREIAS-Oeste stakeholders (MPI – Movimento Pró-Informação para a Cidadania e Ambiente and other partner of RCE), where each prepared some eco-gastronomic dishes that were evaluated by every participant and a jury. The main goals of the contest were to share ideas and recipes and to stimulate student learning.

A programme for Teachers on "healthy lifestyle habits", was organised by RCE CREIAS-Oeste stakeholder, Agrupamento de Escolas Fernão do Pó – Bombarral, with the cooperation of diverse partners, including other RCE stakeholders. RCE CREIAS-Oeste hopes that other schools in the region and the country are stimulated by the design of the training programme presented (*http://vida-saudavel. aefp.pt/*), with talks/communications, workshops (e.g. vegetarian cuisine) and sports practice. The author of this article made a communication about "Natural Food" (*http://vida-saudavel.aefp.pt/programa/alimentacao-natural)*. Despite being in Portuguese, it might be useful for other RCEs, too.

The video series "Edible Nature" is a co-production of two RCE CREIAS-Oeste stakeholders, MPI and Quercus-ANCN (Quercus – National Association for Nature Conservation). The goal is to facilitate identification of plants and their uses, in addition to providing information from the books Edible Wild Herbs – Practical Guide and Edible Wild Berries – Practical Guide, (*Azevedo, 2015*). The next guide, on seaweeds, is likely to be published in 2018. The videos are three to four minutes long and have a simple and didactic approach. The 23 episodes released so far are available on YouTube (*https://www.youtube.com/ user/mpicambiente)* and Quercus TV. Several videos are already subtitled in English.

Seed Saving Workshop. Another activity worth mentioning is the seed saving workshop in which participants learn and share the traditional knowledge about preparation, conservation and sharing of seeds.

Results and Conclusions

Invariably all the activities have been very well received by the participants. They like everything: the recipes, the new approaches and the new knowledge. The feedback received from the local population and the students is that the workshops are stimulating and provide useful information.

The workshops have been mostly directed to the general population, and some to school children. Except for the workshop on edible herbs that has been held annually since 2011, the activities are conducted depending on the availability of trainers and partners, and with the support of RCE CREIAS-Oeste stakeholders. In fact, one of the main weaknesses of RCE CREIAS-Oeste is the lack of availability of its stakeholders. Various commitments and other constraints have been a challenge, but overall the progress looks promising.

As the scope of the workshops is somewhat limited, videos are now being used to spread the message more widely, starting with wild foods.

New interest for these issues is emerging among young students; especially those visiting courses in the food sector with tourists being now the preferred target audience of the activities carried out in schools. RCE CREIAS-Oeste expects that as a result of these activities, an increasing number of consumers will become curious about natural and wild foods, and be open to make changes in their food habits. Increasing demand of natural and wild products in the local markets may stimulate farmers to use more sustainable agriculture techniques and to offer more natural products in the future. Step by step, eco-gastronomy is becoming a powerful vehicle to spread a new vision of sustainable food and agriculture in the region.

For a paradigm change, a FOOD REVOLUTION is needed against the hyper-extension of agriculture and to promote the recovery of native forests – we need a food revolution in favour of the acorn! (*Costas, 2013*).

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CONCEPT OF SUSTAINABLE NUTRITION –
IMPLEMENTATION VIA ESD IN MUNICH

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The Regional Centre of Expertise on Education for Sustainable Development (RCE) Munich (BenE München e.V.) is in Bavaria, South Germany. As the oldest RCE in Germany, it already has ten years of experience in all fields of Education for Sustainable Development (ESD). The RCE is structured as a network of currently 54 (educational) institutions and 21 individuals. One member of RCE Munich is the "Working Group Sustainable Nutrition", and has been part of the development of the holistic concept of Sustainable Nutrition since several decades. In March 2017, the Working Group released the Online-Video-Course (OVC) titled "Sustainability and Nutrition". Another member is the City of Munich, which through its regional programme "Organic City Munich" seeks to promote sustainable nutrition in Munich, mainly in out-of-home catering, especially within educational institutions. This case study covers the theoretical concept of sustainable nutrition as well as practical experiences with its implementation.

1. Development of the Concept "Sustainable Nutrition" (*OVC, Unit 1*)

The predecessor of the concept "Sustainable Nutrition" is the concept "Wholesome Nutrition" (*"Vollwert-Ernährung"*), which was developed at the University of Giessen in the 1980s. Wholesome Nutrition is a mainly plant-based diet, where minimally processed foods are preferred. The central food groups are vegetables and fruits, whole-grain products, potatoes, legumes and dairy products. Native cold-drawn plant oils, nuts, oleaginous seeds and fruits are also important, but should be consumed only in moderate quantities. If desired, small amounts of meat, fish and eggs can be consumed. This concept includes four equally important aspects: health, environment, economy and society (*Koerber, Männle and Leitzmann, 2012*). About a decade later, at the UN Conference on Environment and Development in Rio 1992, Sustainable Development was defined as the guiding concept for global development comprising three "classical" dimensions: environment, economy and society. In addition to sustainable consumption of resources, it requires that equal conditions for every human being on Earth are ensured (*Schneidewind, 2011*).

In 2005, Leitzmann and Cannon established the "New Nutrition Science Project" at a global scale, under the umbrella of the International Union of Nutritional Sciences and the World Health Policy Forum. They incorporated the complementation of the biological focus with environmental and social aspects (*Cannon and Leitzmann, 2005; Leitzmann and Cannon, 2005*).

A few years ago, in dialogue with members of RCE Munich and other experts of ESD, the Working Group Sustainable Nutrition included "culture" as the fifth dimension into the concept Sustainable Nutrition, as food habits are influenced by the respective cultural background (*Figure 1*). Culture has been part of the sustainability dialogue for many years, especially in ESD (*Koerber, Bader and Leitzmann, 2016*).
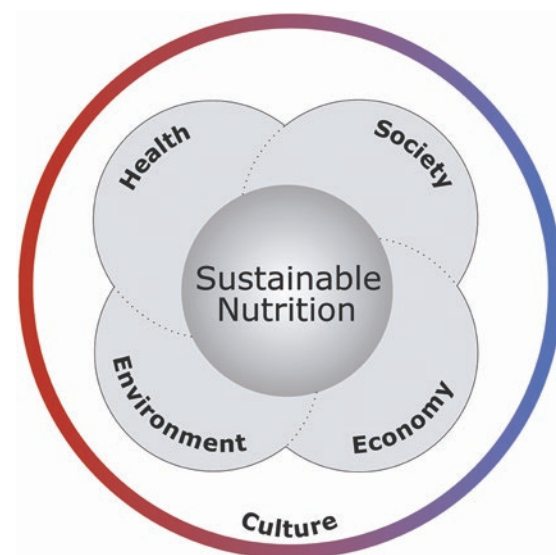

Figure 1: *Five Dimensions of Sustainable Nutrition (Koerber, 2014; Koerber, Bader and Leitzmann, 2016).*

All stages of the food supply chain are considered in the concept of Sustainable Nutrition (*Koerber, Männle and Leitzmann, 2012; Koerber and Hohler, 2013*).

- Input production (e.g. Sustainable Nutrition Principle 2)
- Agriculture (e.g. Principle 2)
- Food processing (e.g. Principle 4)
- Distribution (e.g. Principle 3)
- Meal preparation (e.g. Principle 4)
- Waste disposal (e.g. Principle 6).

(The Principles in parentheses are discussed in Section 3)

In addition to the well-known methodology of life cycle assessment (LCA), which considers mainly the environmental impact of products, in our concept the effects of the stages of the food supply chain are systematically illustrated through all five dimensions of Sustainable Nutrition (*Curran, 2013*).

The concept is an effective communication tool based on holistic thinking as it transforms scientific research into ESD practice. One example is the new Online-Video-Course in German titled "Sustainability and Nutrition", mentioned above. RCE Munich is one of the project promoters. The target groups are multipliers from different professional fields, for example, nutrition sciences and nutrition education, development cooperation, environmental education, as well as students, dieticians and interested consumers.

The participants are invited to reflect critically on the consequences of their personal nutrition habits as well as on the global food systems. They, thus, improve their knowledge of holistic interactions of sustainability in nutrition and their consumer skills. As a next step they may identify solutions, and may be motivated to integrate the newly achieved knowledge both in their personal lives and their professional work. The course consists of nine units (18 lectures of 30-60 minutes each). The videos and slides are available for free (for private use) on YouTube (*https://www.youtube.com/channel/UCIaxfPuvIGVmJ2FNM6u_pZw* or *http://www.nachhaltigeernaehrung.de/ONLINE-VIDEO-KURS-Nachhaltigke.97.0.html)*.

The educational use of the Online-Video-Course is planned at several German universities. It has been approved as "an affiliated project of the 10YFP (10-Year Framework of Programmes on Sustainable Consumption and Production Patterns) Sustainable Food Systems Programme" of the United Nations (*http://www.unep.org/10yfp/about/what-10yfp*).

In the following section, the topics of the concept as well as those of the Online-Video-Course will be presented (*Figure 2*).

1	Sustainability and global challenges	Global challenges
2	Climate change and global food insecurity	
3	Preference of plant-based foods	Principles for Sustainable Nutrition
4	Sustainable/organic foods	
5	Regional and seasonal products	
6	Preference of minimally processed foods	
7	Fair Trade products – food security strategies	
8	Resource-saving housekeeping	
9	Tasty meals – enjoyment without regret	

Figure 2: *Contents of the Online-Video-Course, Working Group Sustainable Nutrition.*

2. Global Challenges Associated with Nutrition

Mankind is currently faced with a multitude of global challenges; some of them are significantly impacted by food habits. Examples are poverty, food insecurity, climate change, soil degradation, biodiversity loss, and water scarcity, as well as economic and financial crises (*Koerber, 2015; Koerber, Bader and Leitzmann, 2016*). This section focuses on climate change and food insecurity.

1. Climate Change *(OVC, Unit 2.1)*

The Intergovernmental Panel on Climate Change states that "human influence on the climate system is clear". Therefore, humans are also responsible for combatting climate change (*IPCC, 2014*).

High income countries are the main contributors to climate change. To reduce the greenhouse gas (GHG) emissions significantly, climate specialists demand the following actions: to create a climate-friendly society, increase energy-efficiency and prefer renewable energy sources over fossil fuels (*WBGU, 2014*). Additionally, a shift towards sustainable lifestyles (which include mobility, habitation, nutrition, energy production, land use and other factors) should be adopted.

In Germany, 25% (and globally more than 30%) of the total emissions are caused by different stages of the food chain (*WBAE and WBW of the BMEL., 2016*). GHG emission per person per year is estimated to be 2,000 kg, considering all stages of the food supply chain. Each food group contributes different amounts of GHG emissions (*Figure 3*). In total, 32% of GHG emissions are caused by plant-based foods and 68% by animal-based foods (*WWF Germany, 2015*). Yet, the consumption of animal products accounts only for 30% of the daily energy intake (*DGE, 2012*). Consequently, a preference of plant-based foods could significantly reduce the climate impact caused by nutrition.
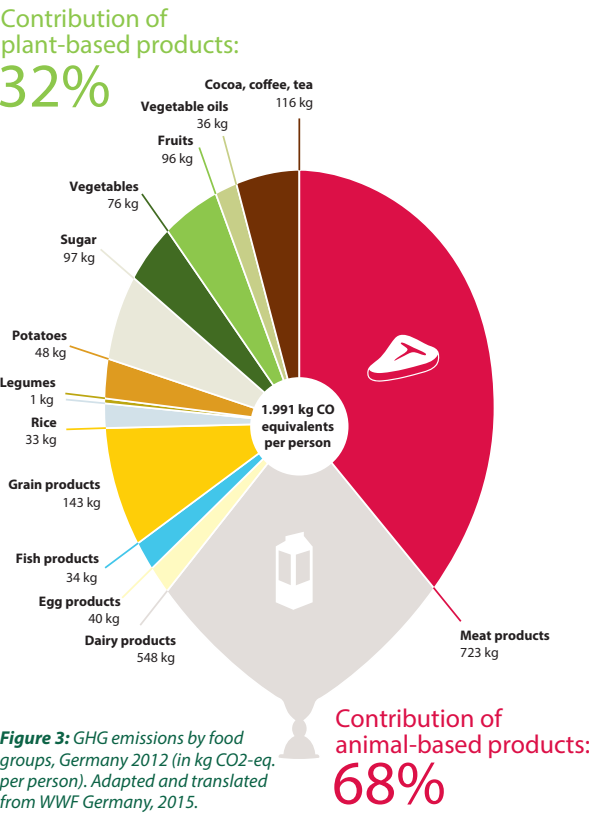

Contribution of plant-based products: **32%**

Contribution of animal-based products: **68%**

Figure 3: *GHG emissions by food groups, Germany 2012 (in kg CO2-eq. per person). Adapted and translated from WWF Germany, 2015.*

2. Global Food Insecurity *(OVC, Unit 2.2)*

Worldwide, about 795 million people are undernourished (*FAO, 2015*). One in nine persons is suffering from undernourishment (*WFP, 2015*). The highest total number of undernourished people lives in South Asia, followed by Sub-Saharan Africa, which has the highest prevalence of undernourishment in terms of percentage of undernourished population (*FAO, 2015*). If people with micronutrient deficiencies – so called "hidden hunger" (*Deutsche Welthungerhilfe e. V., 2015*) – are considered,

about two billion people (of the current world population of 7.5 billion) suffer from insufficient food intake (*UNFPA, 2016*). In 2012, storms, floods and other climate-change-associated catastrophes forced about 32 million people to flee their homes, which led to a further increase in food insecurity (*WBGU, 2014*). Currently billions of people are living in poverty, which strongly correlates with undernourishment. Distribution of global wealth is also highly unequal; about 70% of the world´s population possesses only 3% of the global wealth, whereas nearly 10% of the population possesses more than 80% (*World Economic Forum, 2014*).

Similar conditions apply to land use. People from the Global North claim much more land due to their higher consumption of animal-based products. "Food transformation losses" occur when energy stored in plants is transformed to energy in animal products. However, a moderate consumption of products from ruminants, which can feed on grasslands, not suitable for arable farming, such as beef and dairy products, is acceptable because of "food transformation benefits". These products play an important role in global food security. This applies, however, only to products of extensive and sustainable livestock farming on permanent pastures (*Koerber and Hohler, 2013; Koerber and Leitzmann, 2011; WWF Germany, 2011; Idel, 2012*).

With a growing world population and urbanisation, our consumption patterns are crucial for food security. By 2050, 66% of the world´s population is expected to live in cities (*UN Population Division, 2014*), where food choices tend to be animal-based products and energy-intensive convenience foods (*Shetty, 2013*). This trend, which demands the use of extensive tracts of land, has already started in some transition countries such as China (*Steinfeld et al., 2010*). These dietary changes are predicted to have a higher impact on land use than population growth (*Gerbens-Leenes and Nonhebel, 2002*).

3. Principles of Sustainable Nutrition

The concept of Sustainable Nutrition has developed consistently over the last 40 years with the objective to address global challenges. It contains seven principles, which are phrased in a motivational way. The underlying substantiations are systematically ordered in the five dimensions: health, environment, economy, society and culture (*Koerber, Männle and Leitzmann, 2012; Koerber and Hohler, 2013; Koerber, 2015; Leitzmann, 2003; Koerber and Leitzmann, 2011; Hoffmann, Schneider and Leitzmann, 2011; Schneider and Hoffmann, 2011; Koerber, Bader and Leitzmann, 2016*).

1. Preference of Plant-Based Foods *(OVC, Unit 3)*
Environment: The preference of plant-based over animal-based foods is the most important principle, as the GHG emissions of the former are much lower. Furthermore, the water-footprint of plant-based foods too is lower (*Mekonnen and Hoekstra, 2011, 2012*). Due to the low-efficiency conversion of animal feed into food, the land used for plant-based foods is significantly less than for animal-based foods. Today 60% of the global fish population is exploited to the maximum and 30% is overfished – only 10% is moderately or hardly fished. Every year, millions of tons of fish, the so called "by-catch", die in nets and are thrown back into the oceans (*WWF Germany, 2016; Maribus, 2013*).

Society: 70% of the worldwide agricultural land is under pasture, which is usable in a productive way solely by ruminants. Yet, one third of the arable land is used for animal feed production (*FAO, 2006*). The resulting meat and dairy products cause "food transformation losses" and therefore potential food calories are lost. Feed and food imports create conflicts for land use in low-income countries. Highly problematic for both people and climate is especially the deforestation of tropical rainforests for soy and palm oil production or for pasture land (*Koerber, Kretschmer and Prinz, 2008*). Legal fishing based on EU fishing quotas and fisheries´ agreements, and especially illegal poaching by industrial fishing fleets, can threaten the existence of local fishermen. This has been happening, for example, in African countries where the local fishermen are facing unemployment, poverty, and thus are forced to migrate (*Koerber and Hohler, 2013*).

Health: Consuming plant-based foods increases the consumption of complex carbohydrates and reduces the consumption of fat, saturated fatty acids, cholesterol and purines. Some plant foods contain high amounts of certain vitamins, minerals and phytochemicals. Dietary fibre, which is present only in plant foods, increases satiety, while the energy content is the same or reduced compared to animal-based foods. Studies with vegetarians show several health benefits when compared with meat eaters (*Leitzmann, 2005; Leitzmann and Keller, 2013*).

Economy: Preferring plant-based foods is less expensive except for low-quality products (*Koerber, 2015*). Above all, nutrition-related diseases create high costs for health systems. In Germany, for example, they account for about 30% of the total healthcare costs (*Koerber, Männle and Leitzmann, 2012*).

Culture: In 1950 Germans consumed less than half the amount of meat compared to today (*DFV, 2015*). Meat was consumed about once a week, except by nomads who depended on ruminants. Today, high meat consumption has become normal in most high and middle-income countries (*Shetty, 2013*). Yet, creative vegetarian dishes allow for new taste experiences.

2. Organic Agriculture *(OVC, Unit 4)*
Environment: Organic agriculture is a farming system that considers natural cycles and provides various ecological benefits. Usually the energy efficiency in organic agriculture is higher than in conventional agriculture. GHG emissions, phosphorous and nitrate leaching are decreased per unit of field area. These benefits are not yet clear, if systems are compared per unit of output. A lower amount of harmful residue, like pesticides and animal medication, remain in the soil. Higher soil carbon levels have been found in organic farming, which indicates a higher absorption of CO_2 from the atmosphere and a greater build-up of humus (*Reganold and Wachter, 2016; Hülsbergen and Schmid, 2010*). Organic farming practices species-appropriate husbandry, like more space and free range for the animals. The use of controversial technologies such as genetic modification or radiation treatment of foods is not permitted.

Economy: Farmers benefit from higher prices of organically grown food. Manual labour in organic agriculture and farm-based processing as well as direct marketing has the potential to create more jobs. This results in a price difference compared with conventional products. Yet, the higher costs must be put into perspective as negative externalities (such as environmental or social costs), which are higher in conventional farming, tend to be neglected in most cases.

Society: The import of feed from low-income countries is avoided in high standard organic farming (*Koerber and Hohler, 2013*). In the Global South organic farming can result in yield increases compared to present farming systems and contributes to food security (*Badgley et al., 2007; Pretty et al., 2006; Reganold and Wachter, 2016*). Organic farms often provide additional services such as teaching farms and inclusion of people with disabilities.

Health: Organic foods usually contain less pesticides, nitrates, animal medication and food additives. Artificial additives like colourings, sweeteners, stabilisers and flavour enhancers are prohibited in organic farming. Organic foods can contain a higher amount of phytochemicals (*Koerber and Hohler, 2013*).

Culture: Organic farming often fulfils the increasing demand of consumers for more naturalness and a more intense taste. Transparency and trust between producers and consumers are higher due to their increased social interactions (*Koerber, 2015*).

An overview of the different impacts that conventional and organic farming has regarding sustainability is illustrated in *Figure 4*. Each flower petal is a sustainability indicator. The lengths of the flower petals indicate their level of performance regarding sustainability. Blue petals stand for environment; red petals represent economy; the green petals illustrate well-being and the orange petals show areas of production. Obviously organic farming is better balanced in the respective sustainability dimensions than conventional farming (*Reganold and Wachter, 2016*).
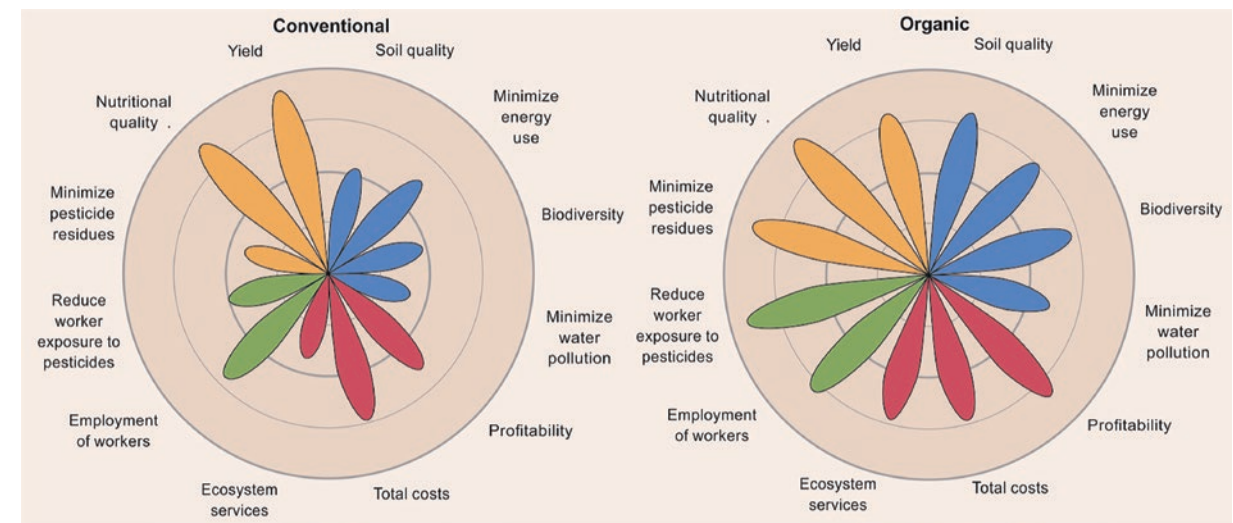

Figure 4: Assessment of organic farming relative to conventional farming in the four major areas of sustainability. (Reganold and Wachter, 2016).

3. Regional and Seasonal Produced Foods *(OVC, unit 5)*
Environment: Energy consumption and GHG emissions are reduced if regional and seasonal products are consumed, due to shorter transportation and avoidance of production in heated greenhouses (*Demmeler and Heißenhuber, 2003*). Air transport in particular causes much higher emissions and uses much more energy than land or water transport. Similarly, trucks emit and consume more than trains (*Hoffmann and Lauber, 2001*).

Economy: Regional networks among farmers, processors, retailers and consumers support small and medium-sized businesses, thereby securing livelihoods (*Koerber, 2015*). This economic benefit can also lead to a general development of the region.

Society: More transparent structures are likely to prevent illegal practices and food scandals, thereby strengthening consumer confidence in food safety (*ibid.*).

Health: Seasonal products, which are not produced in heated greenhouses or plastic tunnels, usually contain fewer chemical residues like pesticides. The content of essential and health-promoting substances can be higher in regional products due to a prolonged ripening period (*Koerber and Hohler, 2013*).

Culture: The prolonged ripening period is likely to increase the taste of regional and seasonal products. The appreciation of regional specialties and biodiversity is on the rise. The diet is more diverse if seasonal variations are part of the food choice (*Koerber, 2015*).

4. Preference of Minimally Processed Foods *(OVC, Unit 6)*
Health: Highly processed foods like fast food often contain a lot of fat, sugar and salt, as well as food additives (*Koerber, et al., 2012*). Food processing like heating, and separation of ingredients like milling of grains can destroy or remove essential and health-promoting substances. However, a few processing methods, like fermentation or sprouting of seeds, increase the amount of desirable ingredients. Minimally processed foods, on the other hand, tend to contain a higher density of nutrients and fewer calories.

Environment: Food processing entails high use of energy and virtual water as well as high pollutant emissions. Less processing reduces the transport volume between single processing stages and the necessity of intermediate packaging (*Koerber, 2015*).

Society: The preparation of raw foods increases the appreciation for these products and for people working in the food supply chain, for example through direct contact at farmers markets (*ibid.*).

Economy: Basic foodstuffs are generally less expensive than convenience products or fast food. Sweets, snacks and alcoholic drinks are higher-priced except for highly processed superfine flour (*Koerber and Hohler, 2013*).

Culture: Food preparation with natural and fresh products is more time-consuming but can increase the appreciation and pleasure of the meals thus prepared. It can improve cooking skills and the sensory perception. Food preparation can also be a social event (*Koerber, 2015*).

5. Products of Fair Trade *(OVC, Unit 7)*
Economy: Fair traded products ensure higher incomes for producers, both in the South and the North. Local farmers depend on fair and stable prices to cover their expenses. With a reduction of intermediate trade, long-term guaranteed purchases and prepayments increase planning security in the Fair-Trade system (*Fairtrade International, 2011*).

Society: In the Fair-Trade system, child labour and forced labour are excluded. The system promotes, for example, training opportunities for local producers, facilitates the founding of labour unions, strengthens collective bargaining power, and supports social projects (*ibid.*). Furthermore, Fair Trade provides social insurance for workers.

Environment: Fair Trade standards set a focus on environmental requirements such as reduced use of agrochemicals, waste management and drinking water protection. It also promotes organic agriculture (*ibid.*).

Health: Enhanced health and safety measures implemented to meet Fair Trade standards, and higher wages that allow higher spending on food and education, can lead to an improved nutritional and health status (*ibid.*).

Culture: Especially in high-income countries, education is required to create acceptance of the higher prices of Fair Trade products, and to raise the sense of responsibility, for example, by highlighting the small price difference between a conventional and a Fair-Trade cup of coffee (*Koerber, 2015*).

6. Resource-Saving Housekeeping *(OVC, Unit 8)*
For resource-saving housekeeping the following aspects are important.

Switching to renewable energy – Most steps of the food supply chain, such as production, processing and household activities, need a lot of energy. The generation of electricity from fossil resources such as coal, oil or natural gas produces high amounts of GHG. In general, renewable energy is safer and more climate-friendly (*Koerber and Hohler, 2013*).

Energy-saving in the kitchen – Electrical devices like refrigerators or dishwashers can use a lot of energy. Therefore, energy efficient devices should be used. Energy labelling of electrical devices in the EU ranges from A+++ for highly efficient to D for low energy efficiency (*DENA, 2014*).

Mode of transport for shopping – Grocery shopping on foot, by bike or public transport is more climate-friendly and cheaper than by car, which is the most environmentally damaging type of transport. If cars are used on a regular basis, all efforts to adopt a climate-friendly diet, such as by eating fewer animal products, are negated (*Koerber and Hohler, 2013*).

Ending food loss and waste – Globally, about one third of the food is wasted (*FAO, 2013*). In Germany, about half of the food loss and waste is caused by private households (*Kranert, 2015*). Considering that 795 million people globally are undernourished, food loss and waste is ethically irresponsible. Thus awareness-raising about this issue is essential (*Koerber and Hohler, 2013*).

Ending packaging waste – In Germany, a person uses 145 kg of packaging per year on average, mostly from food products. To reduce packaging waste, unpackaged products or reusable packaging is recommended. Generally, reusable packages are more climate-friendly (*ibid.*).

7. Tasty Meals *(OVC, Unit 9)*
The joy of eating tasty meals is not contradictive to satisfying health, ecological, economic and social requirements of sustainable nutrition. Pleasure is crucial for implementing sustainability, not only in the field of nutrition (*ibid.*).

4. Challenges for a Transformation of Principles into Reality – Best Practice: "Organic City Munich"
The principles of Sustainable Nutrition raise the question of how consumers can transform them into reality. One of the biggest challenges is the lack of willingness to pay more for sustainable products. They cannot be offered for the same low price because the "true costs" of non-sustainable production are hidden. Optimisation of political and economic conditions is necessary. This includes tax incentives, internalisation of external costs, clear labelling initiatives as well as availability of and education about sustainable products (*Koerber, 2015*). Sustainability should be approached as a multi-stakeholder process. In Munich, a major stakeholder is the City of Munich, along with the Department of Health and Environment and the Department of Education and Sports. In the childcare sector, the City of Munich is responsible for providing Sustainable Nutrition to children at pre-schools and primary schools within its coverage area. At present (2017), about 22,000 pre-school children and 30,000 primary school children are participating.

Efforts in this direction started more than two decades ago. In 1992, the municipal water supplier started an organic farming programme to protect the water sources.

In 2006, the city of Munich took the title of "Organic City Munich" (*Biostadt München, 2006*). According to a resolution by the city council, the city committed itself to increase the use of organic food (SDG 3, 15) in city-run establishments (GAP AA2), thereby aligning with the Sustainable Development Goals (SDGs) and the Global Action Programme (GAP)[1] for ESD. Munich was recognised as a Fair-Trade City (SDG 8, 10) in 2013 (*Fair Trade Stadt, 2013*).

Under the slogan "organic – regional – fair" projects, action fields and issues affecting the entire supply chain were tackled (SDG 2, 12), ranging from agriculture, processing and distribution of food products to preparation and consumption of food.

In October 2016, as part of the objective to use more animal-welfare-friendly products, the city council resolved to further increase the proportion of organic meat and other products in its establishments and to strengthen economic demand for regional products. Meat-based dishes at municipal receptions must use 100% organic meat. In city-run canteens the target is to raise the current 20% proportion of organic meat to 30% (*City of Munich, 2016*).

In the initial pilot programme "Bio für Kinder" (Organic for Children), which ran between 2006 and 2008, first experiences were made together with an ecologically-oriented festival operator (*Tollwood, 2017*). This pilot programme investigated which factors were relevant, explored the levels of costs involved and the management competences required to make childcare catering facilities 100% organic (GAP AA2 and SDGs 2, 8). The results showed that participating institutions could implement 100% organic products with an additional cost of only € 0.34 per child per midday meal (*Tollwood, 2017*).

The seven principles for Sustainable Nutrition were used to adjust the menu plan: Seasonal dishes with fresh ingredients (Principle 3); organically-grown products (Principle 2); integrating participants in the project goals, improving kitchen management and purchasing mainly fair trade goods (Principle 5); reducing meat content (Principle 1) and food waste (Principle 6); prioritising food that is minimally processed (Principle 4); and serving tasty, wholesome dishes (Principle 7).

To support kitchen managers, an online organic menu manager was developed and made available free of charge to all non-profit organisations (*www.biospeiseplan.de*) (GAP AA2, AA5 and SDG 17). The planner offers recipes and long-term healthy menus accepted by children. This online application also makes it possible to calculate purchasing volumes, costs and age-specific portion sizes to enable cost-conscious kitchen management.

Based on these project experiences of Sustainable Nutrition, in 2012, a new quality assessment (*GAP AA1, AA2 and SDG 16*) was introduced as the basis for the city's Europe-wide call to tender for catering in its pre-schools, day-care centres and other interested schools. Catering firms are bound by the following conditions: 50% organic produce in all product groups, 90% organic meat, meat and fish only once in a week, fish caught according to Marine Stewardship Council principles, no Genetically Modified (GM) products, Fair Trade cocoa, food to be bought locally to avoid unnecessary transport emissions, very low proportion of convenience products, and more.

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[1] For GAP, see chapter 5.3 of this case study.

5. Change in Awareness by ESD

A change towards Sustainable Nutrition cannot be realised without education, because of the important role of people´s consumption behaviour.

From a young age, children automatically develop and grow into their nutritional competence as they gradually explore the world of the (adult) eating culture. Because of the increasing disintegration of extended families, i.e. the absence of parents during the day due to their jobs, the task of providing responsible nutrition increasingly falls upon the pre-school and primary education sector.

For the "Organic City Munich", the result is that municipal employees ensure that at least the children in their care receive age-appropriate, healthy nutrition in a pleasant social environment. This promotes the children's personal and health development, and influences their mental and physical abilities and well-being positively.

1. Educational Concept – "Head – Hand – Heart"
Understand (*head*), do (*hand*), experience (*heart*):
To convince people about the importance of sustainability, it is crucial that they can familiarise themselves with the quality of sustainability. The power of persuasion is not in reduction and restraints, but in the credibility of people who have experienced this quality and have integrated it in their work. This principle pervades every aspect of the "Organic City Munich". Some examples:

In institutions: The "organic push" began in 2014, as the staff of all 400 municipal pre-schools was trained in the "head – hand – heart" principle to raise awareness of the new quality standards expected of them. Conveying knowledge of organic products (head), improving kitchen practices (hand) and visiting an organic farm (heart) are the three learning stages of all kitchen management and staff members.

In pre-schools: The cultural skills in a social context, such as how to eat, table manners and the variety of eating habits are important steps learned playfully by children in pre-schools.

In schools: Older pupils learn how to grow and cook food, and learn about organic farming methods, which leads to a greater appreciation of the food they eat.

In the catering trade: The menu provides information on the producers´ animal welfare standards, while "gastro-trips" enable diners to see directly the benefits of animal welfare in agricultural settings.

2. Fields of Education
Formal Education
Pre-school, primary, secondary and higher education offer many possibilities to include Sustainable Nutrition in the curriculum. Focal points are found in the following subjects and parts of subjects: health and nutrition education, home economics, economics and social education, cultural education, geography and natural sciences.

An example of this is "educational cooking": At some grammar schools, classes of 12-year-olds make up the kitchen staff for one month. Purchasing, preparation, food service, point of sale, accounting and clearing away everything, are tasks the pupils perform under the supervision of the regular kitchen staff. They take responsibility for providing lunch to the entire school. Unimagined abilities are discovered; mathematical skills are practiced and, of course, cooking skills are developed. A similar structure is used by the numerous "pupil-led companies" in which pupils organise, prepare and sell break-time snacks.

Non-Formal Education
Educational institutions in the non-formal area are free to choose the most interesting aspects of Sustainable Nutrition for their clients. They can introduce selected aspects in environmental education, global citizen education as well as in cooking courses.

Baking pretzels together at streetlife-festival Munich (© Angelika Lintzmeyer).

To give one example, acceptance of animal welfare (space, special needs) should be encouraged in the catering industry. Kitchen and service staff receive training on how to convey knowledge about the products used in kitchens. One method is "gastro-trips", where everyone (staff and diners together) can directly experience animal welfare at the producers´ agricultural production site.

Informal Learning
Nutrition is not only a private, but also a public issue. To facilitate more sustainable consumer behaviour, producers could provide more sustainably produced foods and retailers could increase their availability and visibility. Many labels and signets exist for such foods, which need to be promoted, and should be clarified, for example by customer advice centres. All forms of media play an important role in the public dialogue on nutrition. Last but not least, information on culture by for example tourist agencies and savoir vivre events are also relevant.

The "Organic City Munich" participates in major events and projects such as the Streetlife Festival (a walking street in the city centre is transformed into a mile-long festival) and Mini Munich (children build, work and live in their own mini-city during the summer, taking on typical social roles, working in the mayor's office, the job centre and restaurants, as bakers, gardeners, and more).

3. Actions According to the Global Action Programme on ESD
To follow up and mainstream the experience during the UN-Decade of ESD 2005-2014, the United Nations agreed on a Global Action Programme (GAP) on Education for Sustainable Development. The various components of the "Organic-City Munich" as well as the Online-Video-Course are connected to the five Priority Action Areas, for example, political decisions (GAP-AA1), allocation of meals in educational institutions (GAP-AA2), Online-Video-Course (GAP-AA3), youth events (GAP-AA4) and multi-stakeholder partnership (GAP-AA5) (*UNESCO, 2014*).

This section describes how each of the GAP Priority Action Areas and some of the Sustainable Development Goals (SDGs) apply to the Sustainable Nutrition programme of the City of Munich and the Online-Video-Course.

Priority Action Area 1: *Advancing Policy*
Municipalities and governments are responsible for creating and enabling an environment for education on Sustainable Nutrition in the field of formal education. They must integrate Sustainable Nutrition into education policies. Through numerous resolutions (SDG 17), the Munich City Council has supported the promotion of education for sustainable development in nutrition. These are as follows:

2006: Foundation of "RCE BenE München" and start of the Organic City Munich project
2008: Programme to reduce consumption of meat and eggs (SDGs 2, 12)
2011: Launch of Organic for Children programme (SDGs 3, 15, 17)
2012: Munich applies to become a "Fairtrade Town" (SDGs 8, 10)
2013: Programme started to prevent food scandals (SDG 2, 12)
2015: Membership of the network of organic cities obtained
2016: City of Munich joined the Bavarian Eco-Pact and the "animal welfare" programme

Priority Action Area 2: *Transforming learning and training environments*
Nutrition is one of the most important aspects in the transformation of learning and training environments. Therefore, the principles of Sustainable Nutrition must be integrated into all education and training settings, especially in canteens. The principles of nutrition could be provided on a poster in a learner-friendly way. Additionally, waste management, a school garden as well as cooperation with organic farmers and beekeepers could be out-of-school educational facilities. School gardens

not only develop practical gardening knowledge, but also influence nutritional habits; something that has been nurtured with care is more appreciated when eaten. "Since I experienced how much effort it takes, I've eaten the salad leaves with my break-time sandwich instead of throwing them away", one pupil said.

In addition, in schools that were not previously subject to the city's catering regulations (in Munich, food provision is the responsibility of the "school family", i.e. the school management, parents and teachers), the proportion of organic meat used is reportedly on the rise. Pilot projects investigated how best to achieve these guidelines to additional schools after the pilot year, from an economic and organisational perspective. On the one hand, the kitchen staff is generally very interested not only to use 100% organic meat, but to convert the whole kitchen into a sustainable one. On the other, there are strict regulations in time and money and limited know-how. This needs more attention.

Priority Action Area 3: *Building Capacities of Educators and Trainers*
The educators and trainers should be prepared to present ESD more effectively and to connect education with nutrition. The Pedagogical Institute (Pädagogisches Institut) offers courses for teachers on school gardens and other topics. The videos and slides of the Online-Video-Course "Sustainability and Nutrition" have been available on YouTube since March 2017 (SDGs 1, 2, 4, 13). The target groups are multipliers from different professional fields, for example, nutrition sciences, development cooperation, environmental education, as well as students, dieticians and interested consumers.

Priority Action Area 4: *Empowering and Mobilising Youth*
The kitchen is a place of never-ending experimental learning. As a field of personal endeavour, Sustainable Nutrition is ideal for youth to act. The OPEDUCA Project in the Netherlands, for example, has implemented this in a notable way since 2008 (*Eussen, 2012*). The holiday programme "Mini-Mü" gives youth in Munich the opportunity to experiment with jobs for two weeks, for example in the field of nutrition.

Priority Action Area 5: *Accelerating Sustainable Solutions at the Local Level*
ESD multi-stakeholder networks with local partners from formal education, non-formal education and informal learning should scale up the promotion of Sustainable Nutrition combined with regional nutrition habits. Some examples of multi-stakeholder partnerships (SDG 17.16 and 17.17) are:

- **Knowledge sharing:** Organic-City Munich is using the concept of Sustainable Nutrition, developed by the Working Group Sustainable Nutrition. The Online-Video-Course is an example of free knowledge sharing (for private use), enabled by private and civil society partnerships.
- **Expertise sharing:** With the help of Organic-City Munich, an organic mentor network was set up in the collaboration project "Organic for Children". Through this, experienced kitchen owners and managers visit educational institutions and work with kitchen staff to achieve an increased proportion of organic produce.
- **Resources sharing:** The Organic-City Munich works with profit and non-profit-organisations in different projects (public-private and public-civil society partnerships). The online organic menu manager (*www. biospeiseplan.de*) is one example of a technical resource developed by Organic-City Munich and made available free of charge to all non-profit organisations.
- **Developing effectiveness monitoring frameworks:** The Organic-City Munich has developed an evaluation framework to measure the effectiveness of its programme parts as well as of the work of partnering non-profit-organisations.

All these examples show how important the different forms of multi-stakeholder partnerships in the context of sustainable nutrition are.

4. Integration of Sustainable Nutrition in National and Global Activities
National Activities
Since 2010, towns and cities in Germany that support organic farming and organic products have collaborated as a network of "organic cities" (*www.biostaedte.de*). The focus is on exchanging experiences, developing joint projects, obtaining subsidies, and conducting campaigns to raise awareness. Through membership of the network, German "organic cities" are seeking to pull more political weight behind the issue. The network is growing constantly and many non-member communities are also participating in this exchange.

The Working Group Sustainable Nutrition participates in the German campaign "Everyone can offer and prepare organic food" ("Bio kann jeder"). It has been running since 2004, and is part of a funding campaign of the Federal Ministry of Nutrition and Agriculture. In Bavaria, the campaign is carried out by the nutrition institute "KinderLeicht". The main target groups are responsible persons in schools and daycare centres, such as educational staff and cooks, but also farmers, processors, distributors etc. The campaign´s workshops are conducted practically on organic products and sustainable nutrition in out-of-home catering for children and adolescents.

Global Activities
Sustainable Nutrition is integrated in global activities of the UN, especially in the 10-Year Framework of Programmes on Sustainable Consumption and Production Patterns (10YFP) (*http://www.unep.org/10yfp*). One of the 10YFP programmes is the "Sustainable Food Systems Programme (SFSP)", run in connection with the Food and Agriculture Organization (FAO) and the United Nations Environment Programme (UNEP). The goal of the SFSP is to promote, enhance and facilitate the shift towards more sustainable food systems.

The Working Group Sustainable Nutrition in Munich is a partner of the SFSP, and the Online-Video-Course Sustainability and Nutrition (mentioned above) is acknowledged as one of the currently ten affiliated projects (*http://www.scpclearinghouse.org/sustainable-food-system/affiliated-projects-sfs-programme*). The book The Joy of Sustainable Eating (*Koerber and Hohler, 2013*), was recognised by UNESCO as an official contribution to the UN Decade of ESD at the global level, and was presented during the Global RCE Conference 2013 in Nairobi.

The principles of Sustainable Nutrition became contractual for all events of the RCE Munich by 2008. RCE Munich hopes that more and more members of the RCE Munich as well as the global RCE community will follow these suggestions.

6. Conclusions
The concept of Sustainable Nutrition is an effective communication tool, as it transforms scientific research into ESD practice (examples include the Online-Video-Course, Organic-City Munich). It is based on holistic thinking and considers the multi-dimensional interactions along the food supply chain. The concept has the potential to cope with some of the global challenges in the field of nutrition.

Sustainable Nutrition promotes the following targets within the five dimensions (in correlation with the SDGs):

- Preventive health protection (SDG 3)
- Fair economic relationships (SDG 8)
- Social justice (SDG 1) and food security (SDG 2)
- Climate protection (SDG 13) clean air and water, healthy soils (SDGs 14, 15)
- Enjoyable eating culture

To reach these benefits, it is crucial to increase the appreciation of our food and for the people working in the food supply chain in the Global South and North. The experience in Munich shows how many political

decisions are necessary to move forward in the direction of Sustainable Nutrition. The installation of municipal coordination centres for other regions that will prepare decision memos, implement and evaluate the effectiveness of sustainable nutrition programmes is recommended. ESD is a promising way to raise awareness about sustainably produced foods. It requires the commitment and support of all stakeholders, scientists, educational institutions, multipliers and consumers to promote the transformation towards a sustainable society.

Governments play an important role in this process. Tools like tax incentives, which allow a privileged treatment of sustainably produced foods, or an increased support of ESD measures can give a new impetus to this transformation.

7. Acknowledgements

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ADDRESSING HUNGER, FOOD SECURITY, NUTRITION, AND SUSTAINABLE AGRICULTURE: THE CHALLENGES OF SUSTAINABLE DEVELOPMENT GOAL NUMBER 2

Gina S. Itchon.

Introduction

The Regional Centre of Expertise (RCE)

Xavier University – Ateneo de Cagayan is located in Cagayan de Oro City on the northern coast of Mindanao in the Philippines. Its mission statement describes the university as 'a Filipino, Catholic, and Jesuit academic community dedicated to the integral development of Mindanao, the Philippines, and Asia-Pacific.' It is the only Regional Centre of Expertise on ESD on the island of Mindanao. As an RCE, Xavier University works with other universities, Philippine government agencies, non-government organisations and civil society to address human development issues and concerns.

Grade 1 lunch feeding session, Cagayan de Oro City, Philippines, SY2016-2017 (Photo credit: Xavier University-Sustainable Sanitation Centre).

The Issue Addressed

An issue of serious concern in Mindanao is that of undernutrition. Undernutrition has a cost to everyone, not just to those who are undernourished. It has more profound implications other than the obvious cost of rehabilitating undernourished individuals. The Philippines is a middle-income country, which, despite exemplary economic performance of 7% Gross Domestic Product (GDP) growth in the second quarter of 2016, is still struggling with the costs of undernutrition (*Yap and Roman, 2016*). This situation is even direr on the island of Mindanao, where development lags behind the rest of the country and nutritional statistics are worse. For example, it is estimated that one out of three school children in Mindanao is stunted, which is also the average in countries of Sub-Saharan Africa (*Geronimo, 2016*). Stunting, which connotes chronic, long-term malnutrition, means that these children are too short for their age. Stunting is significant because it means more than just being short. More importantly, it impacts children's physical and mental growth and, therefore, also their future as adults.

A recent report (*Save the Children and FNRI-DOST, 2016*) estimates that childhood stunting costs the Philippines almost 3% of its GDP. These economic losses result from the following:

a) Lost income as a result of lower level of education achieved by a working population who suffered from childhood stunting;
b) Lost productivity due to premature deaths among children;
c) Additional education costs to cover grade repetitions linked to poor nutrition.

These costs are further multiplied when they are considered with the costs of treating diarrhoeal diseases, intestinal parasite infestation and other diseases that are linked to poor water, sanitation and hygiene (WASH) conditions affecting already weakened children.

Another perspective is highlighted when one considers the interaction of undernourishment with gender. Women bear a greater burden during pregnancy. They exert further

strain on the health system because undernourished women who give birth suffer more medical complications, compared to women who are well nourished. Furthermore, the infants they give birth to are already compromised by a higher risk of birth defects and birth complications. They start life as undernourished infants and will more likely grow up not being able to achieve their full potential as adults. If these other health costs are summed up, the likely economic impact would be an additional 0.05-1.6%. When added to the 3% economic costs already mentioned, the total cost equals almost 5% of the Philippines' GDP (*FNRI-DOST, 2016*).

In an attempt to address this situation, the country's Department of Education (DepEd) has been implementing the School-based Feeding Programme (SBFP) since 1997. This first started as the Breakfast Feeding Programme (BFP), which aimed to address short-term hunger. Through the years, the SBFP shifted focus to addressing chronic undernutrition among public school students (*Tabunda et al., 2016*).

Schools have long been recognised as ideal settings for teaching basic skills in food, nutrition and health (*ibid.*). In many communities, schools may be the only place where children acquire these important life skills. Schools reach children at an age, when food and health habits are being formed; schools also reach families and the school community, and can be a channel for wider community participation.

Nutritional rehabilitation through school-based feeding programmes is a strategy that has proven to be effective in addressing malnutrition among children in many countries. A school is not only a place of learning. For most children, it is also a safe, protective, and constant environment where they can be expected to develop their full potential.

Schools as Ideal Settings for Nutritional Intervention: The Vegetables Go to School Project

Improving Nutrition by Agricultural Diversification (VGtS) is a project that addresses malnutrition, particularly among children, by establishing comprehensive school vegetable garden programmes in selected countries in Africa and Asia. It is being implemented in the Philippines by Xavier University. The project aims to improve nutrition among school children through two basic strategies: 1. school-based feeding of malnourished children, and 2. the establishment of sustainable school gardens. It also aims to demonstrate the links between school-based gardening and feeding, as well as water, sanitation and hygiene (WASH) in the rehabilitation of undernourished children. The project includes four other countries in Asia and

Africa, namely, Bhutan, Burkina Faso, Indonesia and Nepal, and is funded by the Swiss Agency for Development and Cooperation. Project partners include the World Vegetable Centre, the Swiss Tropical and Public Health Institute and the University of Freiburg-Department of Physical Geography.

Weighing of children at Fr. Masterson Elementary School (XU School of Medicine).

The project concept is anchored on Sustainable Development Goal Number 2, which is to end hunger, achieve food security and improved nutrition, and promote sustainable agriculture. Schools were seen as the perfect sites to help achieve this goal.

In the Philippines, the school-based feeding programme of the Department of Education (DepEd) targets moderately and severely undernourished students. Feeding is done for 120 days by giving children a nutritious lunch. DepEd uses the World Health Organization (WHO) weight-for-age tables for pre-elementary school children aged 5 years and below, and the WHO Body Mass Index–for-age tables for pre-elementary, elementary and secondary students aged 6 to 19 years in determining their nutrition status (*Tabunda et al., 2016*).

School gardens, on the other hand, have been a part of the elementary school curriculum in the Philippines since after the Second World War. Gardening is taught and practiced in all public elementary schools in the Philippines and is part of the Technology and Livelihood Education (TLE) subject. In the elementary grades, agriculture, through school gardening, is taught with other livelihood skills such as computer literacy, entrepreneurship, and home economics. School gardening is taught for one quarter and the final outcome of the subject is for students to have a productive vegetable garden.

At present, school gardening is carried out through the 'Gulayan sa Paaralan' (Vegetable Gardens in Schools) Programme in all public elementary schools in the country (*Department of Education, 2015*). Under the programme, all schools are expected to establish and maintain sustainable school gardens, as a source of ingredients for the school-based feeding programme, and to encourage the families of the school children to have their own home garden for continuous nutritional improvement at home (*ibid.*).

Since school-based feeding and school gardening are mandated in the Philippines through the Department of Education, the implementation of Vegetables Go to School (VGtS) in the country is directed more at investigating methods and strategies to make both feeding and gardening programmes more effective in rehabilitating undernourished children. This is in recognition of the reality that the reasons related to undernutrition and its rehabilitation are complex, and often involve the interaction of different factors such as the mothers' level of education, supply of food, family income, general health status of the children, to name but a few.

The study described here focused on the nutritional status of children in 16 government-run elementary schools with the cooperation of the Department of Education, City Schools Division of Cagayan de Oro City. From the

RCE (Xavier University) the units involved were the Dr Jose P Rizal School of Medicine, the Sustainable Sanitation Centre, and the School of Education. Data were collected by students of the Schools of Medicine and Education and the VGtS project staff. They collected the baseline data for weight, height, and Body Mass Index (BMI) at the beginning of every school year, i.e. in June of 2014, 2015 and 2016. This data allowed the schools to identify malnourished children, who were then enrolled in the school-based feeding programme. These children were fed a nutritious lunch in school for 120 days. Measurements of weight, height and BMI were taken midway through the 120 days and again at the end of the feeding period to check for progress.

In the 16 Cagayan de Oro City elementary schools involved in the VGtS Project, the common causes of undernutrition were poor eating habits and the absence of parental guidance. The common phenomenon was that both parents were often absent from home to earn a living and the children were left with some amount of money to fend for themselves. Older children would take care of their younger siblings and would often buy 'junk food' for their meals.

Engaging in the VGtS Project highlighted the following key points:

1. Schools play an important role in nutrition rehabilitation in the Philippines. As highlighted earlier, schools make ideal sites for nutrition rehabilitation, in particular for the Philippines because school-based feeding and school gardening are mandated and are part of the elementary school curriculum.

2. Nutritional rehabilitation is better with school gardens and the presence of water and toilets in schools. The Vegetables Go to School Programme utilised the Department of Education's secondary data for weight, height and Body Mass Index (before and after school feeding) of enrolled school children during the school year 2014-2015. The project collected its own primary data before and after school feeding for the school years 2015-2016 and 2016-2017. Therefore, the data for height, weight and BMI analysed for the project comprised three consecutive school years.

After analysing the data, what became evident can be summarised as follows:
- BMI increased with 120 days of school-based feeding
- BMI declined during vacation months
- BMI increase is better in schools with 24/7 potable water supply
- BMI increase is better in schools with toilets
- BMI increase is better in schools with year-round vegetable gardens

Changes in Body Mass Index (BMI) in relation to WASH variables

Variables	Mean BMI before feeding	Mean BMI after feeding	Net change in BMI
Water			
Present	12.31	15.00	2.39
Absent	12.61	14.44	2.13
Presence of vegetable gardens the whole year			
Present	12.63	15.00	2.37
Absent	12.32	14.43	2.10
Toilets			
Present	12.22	14.60	2.38
Absent	12.73	14.83	2.10

Notes: Difference of net change in BMI for presence and absence of water, sustainable gardens and toilets in schools is significant at p=.05 and n=1920 children.

Conclusion

Undernutrition or malnutrition should be addressed as a broad development issue rather than as a problem that can be solved by a solitary intervention. Nutrition programmes should be comprehensive, implemented in homes, schools and in the community.

Chronic malnutrition as evidenced by children being too short and too thin for their height is an important problem that should be addressed. Solving this problem enables children to achieve their full potential and eventually become productive adults, who will contribute to nation building. Nutritional rehabilitation directly contributes to SDG 2, which aims to end hunger, achieve food security, improve nutrition and promote sustainable agriculture. Therefore, improved nutrition is the platform for progress in health, education and employment that will eventually help the Philippines to achieve true sustainable development.

Ending malnutrition is ultimately a political choice that leaders in governments, donors, civil society organisations and businesses need to take. Good nutrition results in good health, which leads to more productive citizens. More productive citizens will translate to economic improvements for all. Nutrition, including both under- and over- nutrition is now recognised as the single most preventable cause of chronic human diseases (*WHO, 2003*). Integrated, 'outside the box' thinking is essential to foster sustainable solutions in order to address one of humanity's greatest challenges of the 21st century.

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Typical School Garden in Balulang Elementary School, Cagayan de Oro City, Philippines (Photo credit: Xavier University-Sustainable Sanitation Centre).

WAY FORWARD

Unnikrishnan Payyappallimana, Zinaida Fadeeva.

"Health is not a commodity that is given. It must be generated from within. Health action should not be imposed from the outside, foreign to the people; it must be a response of the communities to problems they perceive, supported by an adequate infrastructure. This is the essence of the filtering inwards process of primary healthcare."

Dr. Halfdan Mahler, Former Director General of WHO

Fourteen case studies have been compiled in this publication. From the reflections of these experiences, we have identified five priority areas (*Figure 1*) for strengthening action. These pertain to strengthening the holistic, systemic vision and commitment in implementation; empowerment of stakeholder partnerships and strengthening local governance; firming up of links between local and global through stronger science-policy-practice linkages; focusing on health and sustainability education and health promotion; as well as strengthening collaboration between higher education institutions and local communities.

Figure 1 – Priority Action Areas for Community Action.

Need for Strengthening a Holistic, Systemic Vision and Commitment in Implementation

The policy commitment to strengthen self-reliance for health and well-being in communities through community participation and health promotion are amply evident in the various deliberation and declarations highlighted in the introduction. The challenge is to scale down such global and national aspirations to contextually relevant local policy planning processes, and at the same time augmenting local actions. This requires inheriting and internalising the holistic, systemic vision and deeper commitment for strengthening implementation. The case studies clearly show alignment with global policy ambitions, and a contextualised vision of implementation. This entails that practitioners learn from their successes and challenges, assessing their replicability, and building appropriate capacities among local planners and implementers at relevant levels.

For example, *RCE CREIAS-Oeste* has strategically developed a project that brings together questions of health, food and the environment. They dealt not only with questions of an unhealthy diet, but also with potential environmental problems, resulting from the over-exploitation of healthy foods such as natural and wild products. The educational practices touched upon eating healthy, as a preventive health-related behaviour, and highlighted options for farmers how to benefit from the increasing trend in eating healthy foods, thereby opening new pathways to more sustainable food production systems.

The project of *RCE Mindanao* addresses the rehabilitation of malnourished children and does so through strategies focusing on the issues of food (at school), developing livelihood skills, and through opportunities related to food production (sustainable school gardening). While school gardening, elements of agriculture, and school economics are taught in a number of subjects at schools in the Philippines, the project has demonstrated a new potential for systematically addressing economic and social challenges, related to malnutrition and stunted development. This has occurred by linking these subjects not only to nutrition but also through highlighting the relationships between food, water, sanitation and hygiene.

In an attempt to empower local communities to combat dengue, *RCE Semenanjung* has established a multi-sector and multi-stakeholder programme through a platform for education and change-oriented actions of the Dengue 1 Stop Centre (D1SC). Through connection with universities, the programme has a strong research component. It addresses the education of children, by community empowering programmes through 'Training of Trainers', 'Seek & Destroy', and door-to-door facilitation on dengue prevention. Through the efforts of the RCE, this model has been proposed to be integrated into the national planning process for epidemic control.

Need for Empowerment and Capacity Building of Proximal Stakeholder Partnerships

Institutional, vertical healthcare has often been criticised for being regimented and for disempowering the public. Being non-participatory and stakeholder-sensitive, such planning approaches do not empower the public nor do they consider the relevant, cost-effective local resources. It is implicit that such approaches cannot afford financial resources to address contextual factors, consequently they are not adequately dynamic and adaptive to changing situations and needs. Whereas on the one hand this results in siloed approaches, it also fails

in sustained implementation. At the same time initiatives such as the Alma Ata Declaration was also criticised for being too idealistic and expensive (*Akman, 2017*) which resulted in the decision to focus on selective primary healthcare approaches shortly afterwards (*Brown et al., 2016*). Participation has been variedly defined as local community collectives and networking for information sharing and self-help, to democratic decision making, to active implementation and, to 'shared or delegated power or co-production'. The semantics also differ while using terms such as community participation, involvement, engagement, or empowerment in global policy processes (*Kenny et al., 2015*). Much has been written about agency and empowerment especially in relation to health promotion. Ongoing debates raise concerns, if empowerment has become an individualist, neoliberal thought or whether it is about social political change, leading to health promotion and development (*Woodall et al., 2012*). This is when the critical question of 'power' arises and governance needs to be contextualised in new governance models such as those of the Regional Centres of Expertise. The approach of the RCEs is in alignment with the Framework on integrated people-centred health services of WHO which is based on five strategies: Engaging and empowering people and communities; Strengthening governance and accountability; Reorienting the model of care; Coordinating services within and across sectors; and Creating an enabling environment (Figure 2). The model that the RCEs offer is of empowerment of not just individuals, but the critical role of stakeholder partnerships for sustained and effective enactment.
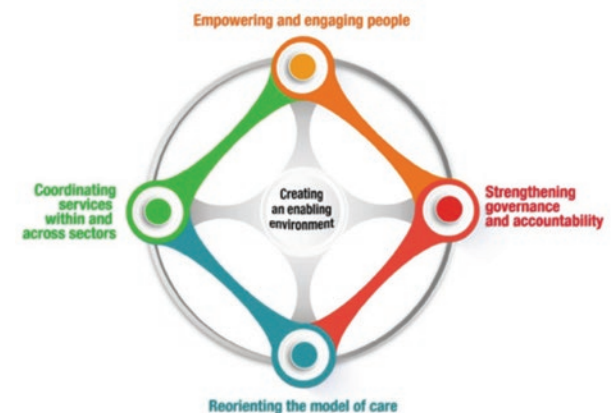

Figure 2 – WHO Framework on integrated people-centred health services[1] http://www.who.int/servicedeliverysafety/areas/people-centred-care/strategies/en

The authors of this book and its book chapters have shown how primary interventions for health or nutrition or hygiene and sanitation can be significantly strengthened by engagement of other sectors, and how these other

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[1] Framework on integrated people-centred health services *http://www.who.int/servicedeliverysafety/areas/people-centred-care/Overview_IPCHS_final.pdf?ua=1*

sectors lead to an increased self-reliance of the target groups and local communities. For example, practices of *RCE Semenanjung* in creating support communities for the rehabilitation of patients with spinal cord injuries showed how strategies of healthcare can change from specialist-driven and controlled activities to one where the patient and relevant partners are building communities that are able to take care of the problem themselves. Empowerment processes where patients can make decisions and act towards changing their own quality of life, are built on the system of interactions between health professionals, peers and mentors. The project of *RCE Mindanao* has a similar strategy for empowering malnourished children to take care of their own livelihoods, thus, turning each of them from a passive 'target' of an intervention to a partner in co-developing their own, healthier, future.

The Need for a Stronger Science-Policy Interface and Linking Local and Global Initiatives

As highlighted in the earlier sections, there have been several multi-lateral and national declarations and initiatives in the nexus between health, hygiene and nutrition. Mediating between 'local and global' is a frequent challenge in development approaches. The difficulties of implementation persist often owing to inadequate links of global policy processes with local contexts and priorities. Figure 3 highlights certain indicative (but not exhaustive) policy areas in this nexus. Adapting globally abstract perspectives and methodologies to local scales with intersectoral implications poses considerable challenges in implementation. In the process of this mediation what happens is the mere linking of global targets with local actions without a clear reflection on how the actions have transformed local lives or would have had implications for bettering lives elsewhere. It is important to identify priority action areas, to conduct local assessments, create evidence, and to set targets relevant to the subnational and local contexts.

Researchers have argued that community participation will assure sustainable, accountable, resilient, cost effective health systems and that health outcomes will improve. But, there is limited evidence of the effectiveness of such 'coproduction' which has prompted more stress on quality and safety reporting in community participation (*Kenny et al., 2015*). This requires retrospective, innovative, transdisciplinary approaches to studying health and well-being in communities. Higher education institutions have a significant role to mediate the science-practice interface.
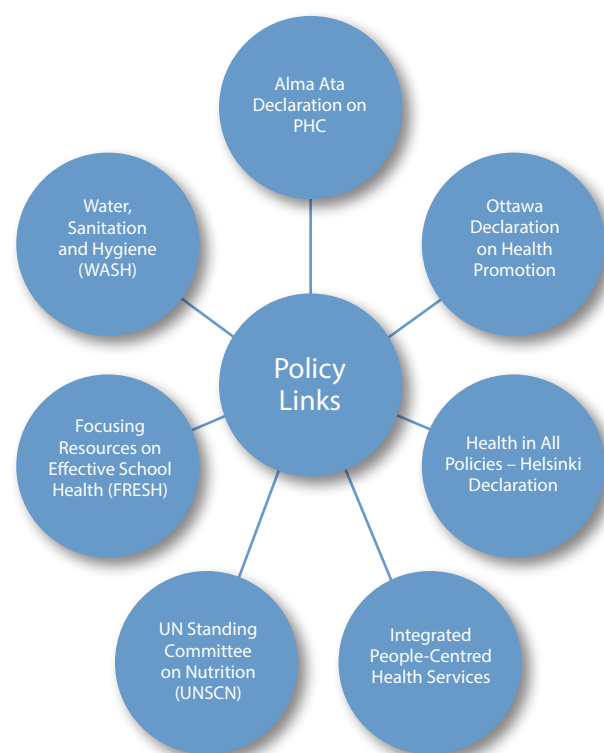

Figure 3 – Relevant Policy Initiatives.

The programme of *RCE Yogyakarta* on the sustainable use of medicinal plants has brought together representatives of a university, a research centre, the industry and local communities. The scientific research resulted in the development of a standardised medicine leading to improvement of the livelihood practices of the community and to community health. The students received an opportunity to practice theoretical knowledge learnt in the academic programme. The enterprise model, working with the community knowledge practices and natural resources also showed an equitable approach of benefit sharing, though it was not explicitly stated.

Need for Stronger Focus on Education for Health Promotion

There is surmounting evidence that a major percentage of the noncommunicable lifestyle diseases, which are not only reasons for mortality but also long-term disability and associated morbidity, are preventable through cost effective approaches (*WHO, 2011*). According to WHO *"Almost one tenth of the global disease burden could be prevented by improving water supply, sanitation, hygiene and management of water resources"* (*Prüss-Üstün et al., 2008*). While there is enough evidence on the importance of preventive and promotive health, there is high disempowerment due to technologically driven, overly disease centred and curative health approaches. It is important to make the promotion of health a key focus of

communities and civil society by empowering formal and informal educational institutions; and through developing the capacities of health educators and community health workers. Traditional and new media and ICT could more effectively be used for health promotion.

The authors of the chapters have demonstrated how by redefining traditional ways of acquiring knowledge (e.g. giver-receiver) and through encouraging stakeholders to become engaged in the power of the learning process more innovation and more sustained outcomes are expected. In the project of *RCE Srinagar*, the challenge of open defecation has been often attributed not to the lack of resources but to the ability of people to understand the issue, and to adequately address it. While state support has been important, it is the educational component that has led to a broader implementation.

The whole institution approach has demonstrated its potential in the practices of *RCE Goa* that identified the priority areas for intervention through a systematic review of the sustainability issues facing schools. Through its STARs (Sustainability Tracking, Action and Reporting in Schools) project, the RCE focused on the integration of the identified priorities in the school curriculum, improving campus operations and developing community engagement. Similarly, *RCE Bangalore*, that sees schools as learning laboratories where habits of good sanitation practices, personal health and hygiene are formed, presented another example of realising the whole institution approach to education for sustainable development. The process included engagement of key stakeholders in the schools – teachers, students and the management, in the formulation of activities and their assessment as well as in the development of supporting materials.

Under *RCE Kunming*, educating teachers and equipping them with opportunities to create competencies for addressing the Human Value Based Water Sanitation and Hygiene Education (HVWSHE) issues, has become the goal of the project. The core of teacher empowerment is a learning that has helped educators to bring value-based education into the educational processes. The teacher as well as student learnings have gone well beyond providing textbooks and conducting routine class room sessions.

The issue of sustainability of programmes after the completion of the intervention has been echoed by many authors. For example, to sustain the dwindling tradition of sustainable use of medicinal plants in the region, *RCE Srinagar* has engaged in a number of strategies that cut across multiple sectors and levels of activities. The bottleneck of the challenge – a possible reluctance of the

community to implement the protection and sustainable use strategies – was addressed with an information campaign, carefully designed to engage significant stakeholders. The interest of each of the groups was anchored to a number of issues specific for each group that ranged from culture to livelihood opportunities. Importantly, the responsibilities to ensure that the information and education practices would carry on after the completion of the project were given to selected stakeholders.

The Role of Higher Education Institutions in Local Community Actions

Higher education institutions (HEIs), are organisations with stable human and financial resources, social responsibility and moral obligations (derived from their academic freedom and autonomy) to address sustainability challenges. Extension services (which may be public service in some contexts) have a significant role to play in developing sensitivity among students as well as academicians on the community relevance of education in an increasingly privatised education of today. HEIs can study issues from multi-level perspectives, generate appropriate evidence and facilitate and advocate not only horizontal but also vertical integration of health promotion approaches.

The presence of HEIs in the practices reflected in the publication is critical for a variety of reasons, including the possibility of engaging researchers in developing a prior understanding of the situation and, thus the possibility of finding an effective course of action in collaboration with other partners. Importantly, and as a credit to the multi-stakeholder engagement culture of the RCEs, the terms of engagement between HEIs and with other local stakeholders within were guided by an understanding of the value of and respect to various forms of knowledge. More thoughtful and flexible interventions of scientists into different stages of the change processes and more sophisticated blends of action research methodologies emerge as a result of collaboration within RCEs. Importantly, such a modality of bringing together research and education between academic and non-academic actors allows fulfilment of (and accounting for) a new function of academic scholarship to address complex societal challenges.

Through the thoughtful combination of the different strategies, HEIs have demonstrated an ability to safeguard development in particularly challenging processes. The combination goes beyond education, research or community engagement functions being taken in siloes. For example, the case of *RCE Greater Dhaka* showed how the initial baseline study collaboratively

undertaken between national and foreign universities has been supported by engagement of research (including exchange) students who facilitated ongoing development in the slum areas. The project demonstrates how effective the university can be in getting involved in work in the local slums, and how the creation of networks of local as well as global linkages were formed to facilitate and to develop learning. *RCE Semenanjung* shows how the university can go beyond a 'patriarchal' professional approach to empower those with spinal injury to become self-reliant and to have a fulfilling existence. They affirm the 'academic social responsibility' to build learning communities, which would eventually lead to community social development. And finally, by showcasing the nutrition programmes in 16 local schools, *RCE Mindanao* illustrates how a university can create and share effective learning by integrating issues like malnutrition, the values of water, sanitation and hygiene, livelihood education and shared responsibilities in the programme for home gardens.

Conclusion

Nearly forty years have passed since the World Health Assembly (*1977*) and the Alma Ata Declaration (*1978*)[2], and other milestone declarations in multi-lateral health policy making. These milestones made visionary calls for urgent action towards comprehensive primary healthcare by all member states for achieving health for all through intersectoral planning. These declarations have constantly asserted that healthcare cannot be improved by a formal institutional health sector alone, but by the promotion of health through self-reliance in communities and synergising action around education, health literacy, hygiene and sanitation, agriculture, nutrition, healthy settlements, participatory development planning and monitoring, and strengthening local governance. The sustainable development goals (SDG) too have reiterated this intersectoral and integrated action for strengthening health governance. Promptly WHO, in its iteration on the SDGs, highlights this multi-sectoral nature of the determinants of health and the need to have health addressed across policy planning to promote and protect health[3]. These are swiftly accepted by most member states, nevertheless, the commitment to implementation has been uneven (*United Nations, 2017*).

The case studies show tacit multi-stakeholder community actions integrating cross sectoral issues that are in synergy with global development goals and ambitions. For these partnerships to be effective, it is important to have the strategic involvement of critical stakeholders, a collective vision, deep commitment, critical competencies, strong intersectoral coordination and governance, and constant reflection for path correction (*Fadeeva et al., 2014*). Some of these projects are locally specific in design and scale and are actively driven by contextual developmental ambitions and value systems. That often makes them too small to have a macro appeal. Their impact and effectiveness are also valued within those limited frames, yet such initiatives are based on process driven, continuous learning and quality improvement. Finally, towards achieving the 2030 Agenda such contextual reflections remain critical in translating the global aspirations and goals into lived experiences and for 'building peaceful, just, and inclusive societies'.

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