

ኢትዮጵያ ፳፬
ETHIOPIA 20
50
GRAND CHALLENGES AND OPPORTUNITIES



GRAND CHALLENGES AND OPPORTUNITIES

DECEMBER 19 & 20, 2019
Skylight Hotel, Addis Ababa, Ethiopia

INTERNATIONAL STEERING COMMITTEE

Samuel Kinde, *Professor*
Tesfaye Workineh, *Engineer*
Shifferaw Taye, *Professor*
Masresha Fetene, *Professor*
Mahder Tadesse, *Architect*
Yasmin Abdu Bushra, *Architect*

Demirew Getachew, *Economist*
Samrawit Kassaye, *Engineer*
Seifu Bihonegn, *Engineer*
Dejene Woldemariam, *Engineer*
Tesfaye Teshome, *Associate professor*

TECHNICAL COMMITTEE

Abdissa Lemma, *Engineer*
Asrat Worku, *Professor*
Deres Tesfaye, *Engineer*
Desta Mebratu, *Professor*
Hailu Seifu, *Engineer*

Samuel Kinde, *Professor*
Shifferaw Taye, *Professor*
Yohannes Afework
Gabriel Seifu, *Engineer*

ADVISORY BOARD MEMBERS

Zafu Eyesuswork Zafu
*Tech & Relations Advisor to CEO,
United Insurance SC; Board Chair,
United Bank SC, Vice Chair Raya
Brewery SC*

Arega Yirdaw, PhD
*Group CEO MIDROC Technology
Group and President, Unity University*

Dr. Tewolde Gebremedhin
CEO of Ethiopian Airlines



CO-HOSTS

PARTNERS

MEDIA PARTNER

EXECUTIVE SUMMARY

As Ethiopia's population continues to grow dramatically and is projected to reach almost 200 million by 2050, the scale of challenges that await the Country in terms of basic and critical infrastructures in energy, water, food, housing, transportation, renewable resources, etc., are staggering. Unless proactive efforts in predicting these massive needs are carried out early and thoughtful plans to address these are prepared accordingly, it will be hard not only to eliminate poverty but also to avoid the threat of the accompanying highly destabilizing societal problems. Arguably, the next set of potential conflicts in our region could be driven by the competition for valuable resources such as water that will be further exacerbated by pressure from population increase and adverse effects of climate change.

This said, however, the Country has also gotten ample resources that will put it in a very favorable position to make use of these opportunities to overcome these potential challenges and surpass its own domestic needs. The absolute and proportional sizes of its youthful population, its natural resources and emerging class of its educated and skilled citizens in and outside the Country are all its yet-not-so-fully tapped to opportunities that will put it in a superb condition to become one of the developed nations sooner than later if these are led and managed in an informed manner and with the right policy tools and implementation, monitoring and evaluation strategies and instruments in place.

Following these observations, a group of like-minded engineers who felt that engineering and technology professionals along with architects, planners and the various multi-disciplinary professionals in agriculture, health, education, economics, management, among others, are well positioned to appreciate these problems and to synthesize the available multitude sets of opportunities, and offer thoughtful and practical solutions initiated an effort to formulate collective series of visions to address these societal challenges. With the critical support of the country's leading professional organizations, an international steering committee was then formed to (a) lead this effort towards completion through an international technical conference; and (b) select Blue Ribbon Panel to write a comprehensive report.

This forthcoming report, which will be a product of the international conference on the various subjects, is intended to serve as a starting point for national conversation amongst policy-makers, political and economic leaders, professionals and various stakeholders and serves as input towards formulation of concrete and actionable sets of policies. Specifically, through sets of grand visions and a series of peer-reviewed reports and white papers by subject matter experts, and extracted from their years of research and industry experience, among others, in a variety of engineering, technology, planning, education as well as multi-faceted policy formulation and implementation disciplines, the report will offer bold, feasible, and actionable grand ideas for addressing the top ten grand challenges of the country.

Blue Ribbon Panel of independent professionals will author this "Ethiopia 2050" final report, the successful outcome of which will be measured through its impact in (a) influencing policy making in the years to come and (b) encouraging the subsequent launch of entrepreneurial, public, and government activities around the proposed solutions.

INTERNATIONAL STEERING COMMITTEE



SAMUEL KASSEGNE

Professor, Department of Mechanical Engineering
Deputy Director, NSF ERC Center for Neurotechnology

Samuel Kinde is a professor of mechanical engineering at San Diego State University in California, USA. He holds a Ph.D. degree in engineering mechanics from Virginia Tech. His research interests are in the general areas of advanced manufacturing with focus on semi-conductor relevant microfabrication and nanofabrication.

Dr. Kassegne is currently deputy director of National Science Foundation funded (~\$40 million for 10 years) ERC (Engineering Research Center) called CNT (Center for Neuro-Technology). The leading partner institutions are University of Washington and MIT. Dr. Kassegne has an extensive industrial experience in microfabrication and nanofabrication through his employment at Nanogen, Microfabrica and Bentley Systems in Southern California and several start-up companies. He recently co-founded Grapheton, a neural probe company based in San Diego, California.

Inspiration and Motivation for ETHIOPIA 2050

I hope we are able to keep the momentum and create an environment where the Initiative is sustainable and capable of positively impacting both policy and the lives of our people.



TESFAYE WORKINEH

President, Ethiopian Association of Civil Engineers

Eng. Tesfaye Workineh is a practicing professional highway engineer with an MSc. in Civil Engineering specialized in Highway Design from USSR, a Certificate in Project Management from Ethiopian Airlines and a Certificate in Supervisory Management from EMI. He is the Managing Director United Consulting Engineers Plc. /UNICONE/and he is also the President of Ethiopian Association of Civil Engineers. Eng. Tesfaye is an associate Member of American Society of Civil Engineers and a Council Member of Arbitration and Conciliation of Addis Ababa Chamber of Commerce.

Inspiration and Motivation for ETHIOPIA 2050

I wish that the output of this conference and the initiative in general creates a positive impact on our development policies to be formulated and that I will be alive to witness the greater version of ETHIOPIA.



SHIFFERAW TAYE

Professor

Professor Shifferaw Taye, PhD, MBA, PPSt & Br, PPCoTeM is an Associate Professor of Engineering Mechanics & Structural Engineering at Addis Ababa University and Advisor at the Ministry of Urban Development & Construction on Capacity Building, Technology Transfer and Policy matters.

He is a Fellow of the Ethiopian Academy of Sciences (EAS) and Ethiopian Association of Civil Engineers (EACE) as well as a member of the American Society of Civil Engineers (ASCE), American Institute of Steel Construction (AISC), and International Association for Bridges & Structural Engineering (IABSE).

He has lectured both in the Country and abroad in areas of structural engineering and construction management both at postgraduate and undergraduate levels.

He established and managed an ISO 9001-certified, Cat II Specialized consulting firm, STRANCOM Engineering, where construction quality and delivery audits had been among the Company's operations in addition to the design of high-rise buildings and other facilities, waterworks structures, latticed towers, light-gauge steelworks, and railway project civil-works.

Inspiration and Motivation for ETHIOPIA 2050

The Future is Brighter!



MASRESHA FETENE

Executive Director, Ethiopian Academy of Sciences

Prof. Masresha Fetene is the Executive Director of the Ethiopian Academy of Sciences. He is a Plant Ecophysiologicalist who obtained his PhD from the University of Darmstadt, Germany. He has been teaching in the Department of Biology, at Addis Ababa University for over 35 years where he has supervised to successful completion over 40 Masters students and 15 Phd students. He served as the Vice President for Research of Addis Ababa University from 2009 to 2013. Prof Masresha is a recipient of several research awards and fellowships including UNESCO-ICRO research award and the Alexander von Humboldt Fellowship. He is a founding and active member of many professional associations including international ones. Professor Masresha has worked actively for the establishment of the Ethiopian Academy of Sciences and has served as Vice- President of the Launching Board for the Establishment of the Academy.

Inspiration and Motivation for ETHIOPIA 2050

I hope to see Ethiopia 2050 as a springboard for policy ideas for Ethiopia's development.



MAHDER TADESSE BERHANU

Secretary, Association of Ethiopian Architects

Mahder Tadesse is a registered professional architect with a B.Sc. in Architecture and Urban planning and a graduate studies background on Sustainable urban management. She is currently the deputy managing director of the architectural and engineering consulting firm, Dynamic Planners plc. She is also serving as Secretary of the Association of Ethiopian Architects for a two year term period (2018-2020).

Inspiration and Motivation for ETHIOPIA 2050

I hope that the initiative ETHIOPIA 2050, gives rise to a paradigm shift on the nation's direction in development and that generations to come will bear the fruits of the policy reforms made as a result of the documents produced.



YASMIN ABDU BUSHRA

Publication Chairwoman, Association of Ethiopian Architects

Yasmin is a 24-year-old architect educated at the Ethiopian Institute of Architecture, Building Construction and City Development. She is the co-founder of CDIP | Creativity in Design & Innovation for the Poor, a collective working to serve communities who can benefit the most from thoughtful and efficient research + design yet have the least access to it. Through her work, which includes small scale experimental projects and public space installations, she advocates for spatial justice in the pursuit of inclusive and resilient cities and communities. Yasmin is currently studying for her Masters in Urban Development & Livelihoods at the College of Development Studies at Addis Ababa University. She is also an acting member of the Executive Committee of the Association of Ethiopian Architects as the Chairwoman of Publications.

Inspiration and Motivation for ETHIOPIA 2050

It is my utmost aspiration that 'ETHIOPIA 2050' inspires people into action, I hope it stimulates collective attitudes of potential into helping us break the chains of limitations and ultimately fear. I hope such actions propel us to unapologetically trespass self-deprecating practices and cultivate clarity about the true potential of our country. As a result of such practices, I hope I see Ethiopia in 2050 as a space that has created its own narrative by emerging from confusion to clarity upon self-reflection.



DEMIREW GETACHEW

Head, Secretariat of EEA

Mr. Demirew Getachew has obtained MSc in Policy Analysis and BA Degree in Economics from Addis Ababa University. Currently, Mr. Demirew Getachew is the Head Secretariat of the Ethiopian Economic Association (EEA) (Since April 2006 to date). Hear, he has fully supported and contributed to the research activities of the Association; served as member of the Editorial Board and co-editor of the Ethiopian Journal of Economics and as a member the editor of the many publications of the Association that includes Proceedings of the International Conferences on the Ethiopian Economy, Proceedings of Regional Conferences, etc. He has been working in Ministry of Revenue as the Head of Planning and Research Department (From December 2003 to April 2006). He has been also working in the Ministry of Finance and Economic Development in the Project Department as project appraisal senior expert on public projects/ programs (From September 1987 to December 2003). His long years experience in the Macro government institutions with the responsibility of dealing with Policy Analysis, Development Project Appraisal and Planning has helped him to sharpen his understanding of the economic stand of the country and different aspects of the socio-economic situation of the country.

Inspiration and Motivation for ETHIOPIA 2050

30 years from now, Ethiopian population will be doubled and reached about 200 million. Unless proactive measures have not been taken ahead, this will bring about serious challenges in terms of providing adequate food-security, energy, housing, transportation, and health-care etc. to meet the growing population needs. Thus, as an individual and leader of the Economics Association, I would like to contribute to meet the changes that we are going to face through research and promoting the issue to the public and policy maker.



SAMRAWIT KASSAYE

Electrical & Computer Engineer

MS.c. in Electrical & Computer Engineering and Lecturer at AAiT, Current President of Ethiopian Society of Electrical Engineers (ESEE)

Inspiration and Motivation for ETHIOPIA 2050

I hope, if such concerns exist and discussed openly through out the community, Ethiopia will have all the solutions to the upcoming challenges which is expected from each one of us as a citizen. And am very happy to be part of it!



SEIFU BIHONEGN ALEMU

Professional Civil Engineer

BSc. in Civil Engineering from Addis Ababa University with a 15 year of experience as a construction engineer, projects manager, engineering department head, technical manager, construction management and projects control director for construction and consulting companies.

Current commitment – Design and construction consultant for building projects
- He is a trainer for construction management and conditions of contract and an Executive Committee Member of Ethiopian Civil Engineers Association

Inspiration and Motivation for ETHIOPIA 2050

I want to see a succeeding Ethiopia in my age, bringing out poverty, building physical infrastructure and working on human capital by creating an efficient state bureaucracy.



DEJENE WOLDEMARIAM

Engineer

Dejene Woldemariam has an M.Tech in Civil Engineering from the Indian Institute of Technology, Kanpur and BE from Guindy Engineering College, Madras, India. He has more than 30 years of professional experience in various positions in government and private sector. He was a Head of the Research and Development Service at Arba Minch Water Technology Institute and later joined the Ministry of Water Resources. For more than 16 years he managed MDI Consulting Engineers and worked on major infrastructure projects. Mr. Dejene has been involved in carrying out Environmental and Social Impact Assessment for several hydropower projects and these include Tekeze, Beles, Gibe II, Gibe III, GERDP and Koysha projects. Currently, he is a shareholder and General Manager of Davis & Shirliff Ethiopia PLC. He is also a founder and Board Chairman of Acme Engineering and Trading PLC and Menagesha Biotech Industry PLC.

Inspiration and Motivation for ETHIOPIA 2050

I hope ETHIOPIA 2050 initiative will influence policies and programs in the future and contribute for the transformation of the country and for the benefits of all its citizens



TESFAYE TESHOME FENTABIL

Phd, Associate Professor

Tesfaye Teshome Fentabil, Ph.D., MBA, is an Associate Professor of Forest Management and Deputy President, Research, Publication, Communication, University-Industry Linkage at Unity University, Addis Ababa, Ethiopia. He obtained his doctoral degree from Aberdeen University, Scotland, UK. (1996), MSc in Technical University of Dresden, Germany, and Diploma from Wondo Genet College of Forestry, Wondo Genet, Ethiopia. My experience covers engaging as Dean Wondo Genet College of Forestry and the then Faculty of Forestry at Haramya University, Vice President for Academic Affairs and Research at the then Debu University now Hawassa University and Director General, Higher Education Relevance and Quality Agency (HERQA). He has published several journal articles, book chapters, and conference proceedings in varieties of forestry and education topics. Journals include Forest Ecology and Management, Elsevier; Southern African Forestry Journal, SINET: Ethiop. J. Sci.

Inspiration and Motivation for ETHIOPIA 2050

I am very much inspired by the concerted effort made by like-minded professionals who devoted their time to initiate the "Ethiopia 2050" conference. I believe that Ethiopia withstands and addresses all the critical challenges it has faced now through the efforts of its determined professionals and the public at large in a short period. The engagement of the professional in this venture needs to continue on sustainable fashion to make sure that all that we have planned becomes a reality.

ASSOCIATIONS

CO-HOSTS



Joint Ethiopian Engineering Professionals' Associations

Founded 2019

- የኢትዮጵያ ሲቪል መሥሪያሰቦች ማህበር
- የኢትዮጵያ ኤሌክትሪካል መሥሪያሰቦች ማህበር
- የኢትዮጵያ ሜካኒካል መሥሪያሰቦች ማህበር
- የኢትዮጵያ ኬሚካል መሥሪያሰቦች ማህበር
- የኢትዮጵያ ኮንስትራክሽን ቴክኖሎጂ እና ማኔጅመንት ባለሞያዎች ማህበር
- የኢትዮጵያ ኢንዱስትሪያል መሥሪያሰቦች ማህበር
- የኢትዮጵያ የህንጻ መሥሪያሰቦች ማህበር

የሀብረቱ ዓላማዎች፡-

- አባል ማህበራት ማጠናከርና መሰረታዊ ድጋፍ እንዲያገኙ ማድረግ፤
- አባላቱ ሙያዊና ሀገራዊ ጠቀሜታ ያለው ስራ በጋራና በግል እንዲሰሩ ማድረግ፤ መደገፍና ማበረታታት፤
- አባል ማህበራት በጋራ የሚጠቀሙባቸውን ጉዳዮች ከገንዘብ፣ ጊዜና ጉልበት ብክነት ነፃ በሆነ መልኩ ጥቅም ላይ እንዲውሉ ማድረግ፤
- አባላቱ እንዲጠናከሩ ከመንግስትም ሆነ ከሌሎች ድርጅቶች በገንዘብና በዓይነት የሚሰጥ ድጋፍ እንዲገኝ ጥረት ማድረግ፤
- አባላት ያሉባቸውን ግሮች በቅርብ በማጠናከሩ ለማፈላለግና ግሮቹ እንዲወገዱ እገዛማድረግ፤
- በምህንድስናና በቴክኖሎጂ ዘርፍ ያሉ አዳዲስ የፈጠራና የምርምር ስራዎች ሊከናወኑ የሚችሉበትን መንገድ ማመቻቸትና የተከናወኑና ውጤታማነታቸው የተረጋገጡ ሥራዎችን ማስተዋወቅና ወደተግባር ለሽጋገሩ የሚችሉበትን ሃሳብ ለሚመለከተው አካል ልዩ ውሳኔ ሀሳብ ማቅረብ፡፡
- በአባል የሙያ ማህበራት መካከል የቀረበ ግንኙነት እንዲኖርና የአሠራር ልምድ ለመለዋወጥ ተገቢውን መድረክ ማዘጋጀት፤
- በተለያዩ የምህንድስና እና ህንፃ ሙያዎች ላይ መመዘኛ ማዘጋጀት፤ መመዘን እንዲሁም ብቁ ለሆኑት ምስክር ወረቀት መስጠት፡፡



Founded 2010

The Ethiopian Academy of Sciences (EAS) is an autonomous, non-profit, nongovernmental organization established in 2010 and recognized by Proclamation 783/2013 in March 2013. EAS aims to provide evidence-based advice to the Government and to promote the development of the sciences and their applications by undertaking consensus studies, organizing conferences and workshops on significant national issues, awarding prizes in recognition of excellence and publishing reports as well as periodicals and books. EAS also aspires to promote literature and the arts and make a contribution to cultural revival through the cultivation of the arts and generation of public interest and engagement.



Founded 1991

EEA has the following Vision and objectives:

Vision:

"To become the premier Economic Association in Africa renowned for its excellence in membership services, capacity building and economic policy research."

Objectives:

Economic policy formulation competency, Promote the discipline of economics, Economic research and dissemination of research findings, As a fora for dialogue and Promote professional contacts

EEA has a research, publication and training arm, Ethiopian Economic Policy Research Institute (EEPRI) established in 2000. EEA has undertaken many researches on socioeconomic issues. The support it provides to Federal and Regional Governments is particularly worthy. The Annual International Conference has created a platform for presenting and discussing development issues that have been relevant to the Ethiopian economy. EEA publications have served as outlets for reference materials and inputs for the economic and social policy making process.



Founded 2008

Unity University, which is member of MIDROC Technology Group Companies, is the first full-fledged privately-owned institution of higher learning in Ethiopia, with a status granted by the Federal Ministry of Education in November 2008. The University offers various programs both at undergraduate and postgraduate levels. Unity University has four colleges. College of Business, Economics and Social Sciences, College of Technology and Computational Sciences, College of Distance and Continuing Education and SalaM College of Health Sciences. The University has more than 15, 000 students and over 240 instructors. In 2016/17, a new Campus was established at Geferssa and it offers undergraduate programs in Animal Production and Technology, Horticulture, Accounting and Finance, Management and Marketing Management. Keraniyo Campus is the latest Campus, it offers undergraduate programs in Accounting and Finance, Management and Marketing Management.

PARTNERS



Ministry of Finance

The Ministry of Finance (Amharic: የገንዘብ ሚኒስቴር) is a ministry within the cabinet of the Government of Ethiopia. It is responsible for general financial management and economic policy of Ethiopia, in addition to the allocation of economic assistance.



Founded 1991

The Association of Ethiopian Architects (AEA) was founded upon the objective to promote the advancement of architecture in the country, conduct CPD training and research works, ensure members adhere to a professional code of ethics in the practice and generally keep the professional interests of its members. AEA has a set mission to engage proactively on the advancement of Architecture through design excellence and to ensure ethical practice. AEA is committed to being a leading institution in shaping the built environment in the region by 2038.

MEDIA PARTNER



Founded 1998

CAPITAL is the longest established English newspaper in Ethiopia that is celebrating its 22nd anniversary this year.

We take to heart our motto, The paper that promotes free enterprise even more as conditions and best practice policies of doing business continue to improve in Ethiopia. Our timely reportage and analysis of the rapid paced national development has become required reading for the business community, NGOs, international organizations, academics and others. CAPITAL is not only about development and business news. In fact in this globalized village all current events are ultimately part of business news.

INTRODUCTION

Population growth projections for Ethiopia suggest that the country's population will reach 150 million by 2030 and a staggering 200 million by 2050 [1-3]. As things currently stand, the country's population is already projected to reach 120 million by 2025 positioning Ethiopia to be among the top 10-15 populous countries on the planet.

Among a multitude of potentially destabilizing societal threats that this population growth could bring, the issues of providing adequate food-security, energy, housing, transportation, and healthcare for these additional 30-40 million Ethiopians in the next few decades stand out as sources of significant risk factors. For example, with regard to housing, it has been recently argued that 25 new cities with size equivalent to present Dire Dawa are needed or the current 10 cities such as Addis Ababa, Bahir Dar, Hawassa, and Dire Dawa will have to become mega cities of 10 million or more to accommodate this growth [4-5].

By 2050, the country's urban population alone is projected to reach 70.5 million with urbanization rate of ~37%, up from the current rate of ~16% [6]. In addition to this population increase, climate change, increasing and unsustainable societal gap in income and quality of life will pose additional pressures. How, then, can such monumental challenges that await the country be handled? How are we going to provide adequate drinking water for potential 10 million Addis Ababans? What sort of bold and innovative engineering solutions can be proposed to address these challenges [7]? What is the role of technology in meeting societal grand challenges? And, no less important is to assess, synthesize and utilize the variety of available tremendous resources – youthful population, natural resources, and diverse climatic and weather conditions as well as highly educated and skilled citizenry both in the Country and abroad, among others.

This report presents some of the ideas generated by the best minds of our time to proactively address these challenges. This effort spearheaded by a steering committee of volunteers is inspired and influenced by similar large-scale efforts in the US, Europe, and other places around the globe.

Examples include the US National Academy of Engineering's "Grand Challenges for Engineering" Report [8], NSF's 10 Big Ideas [9], and Consensus Study Report of National Academies of Sciences, Engineering, and Medicine [10].

REFERENCE

1. Summary and Statistical Report of the 2007 Population and Housing Census Results, Ethiopian Central Statistical Agency, Ethiopian Census, First Draft, 2007, Addis Ababa.
2. Population Reference Bureau, 2010, World Population Data Sheet, www.prb.org, 2010.
3. <https://money.cnn.com/2015/08/18/news/countries-with-biggest-populations/index.html>
4. Gebeyehu Abelti, Brazzoduro, M. and Behailu Gebremedhin, "Housing Conditions and Demand for Housing in Urban Ethiopia, In-depth Studies from the 1994 Population and Housing Census in Ethiopia", Central Statistical Authority (CSA), Addis Ababa, Ethiopia and Institute for Population Research – National Research Council, Roma, Italy, October 2001.
5. Zegeye Chernet, "The NEXT Urban explosion in Ethiopia", EiABC - EiABC, 2003.
6. Tsegaye Tegenu, "Urbanization in Ethiopia: study on growth, patterns, functions and alternative policy Strategy," Stockholm: Stockholm University; 2010.
7. Tadesse H/Selassie, "Engineers Proposal on how to Eradicate Hunger from ETHIOPIA", Berta Construction, Addis Ababa, Ethiopia, September 2002, Paper Presented at Ethiopian Association of Civil Engineers Meet.
Highlights: http://www.ethiopians.com/Engineering/engineers_proposal_on_how_to_eradicate_hunger.htm
8. National Academy of Engineering (NAE), "NAE Grand Challenges for Engineering," <http://www.engineeringchallenges.org>, accessed January 15, 2019.
9. Bill and Melinda Gates Foundation, "Challenges," <http://gcgh.grandchallenges.org/challenges>, accessed January 15, 2019.
10. American Institute for Physics, 2016, "NSF Director Córdoba Proposes Nine Big Ideas," June 14, <https://www.aip.org/fyi/2016/nsf-director-cordova-proposes-nine-big-ideas-foundation>.

SPECIFIC OPPORTUNITIES & CHALLENGES



Access to Clean Water

Supply of water to urban areas like Addis is dwindling. The competition for water access in arid areas like the Afar and Ogaden will eventually reach crisis stage as pressure from increasing populations mounts.



Access to Health Care

How do we build a scalable healthcare system? What are the best practices to develop and sustain an accessible and affordable health care system? What are the innovative approaches and the role of preventative health services?



Advanced Manufacturing

How do we prepare Ethiopia for Industry 4.0 with advances in intelligent manufacturing, additive manufacturing, and related manufacturing technologies?



Energy Demand

How do we scale-up energy generation and distribution, with particular focus on sustainability and renewable resources in mind? How do we develop an integrated approach to sustainable energy management?



Food Security

How do we increase agricultural productivity to keep pace with this increase? How can we achieve food availability, food access and food adequacy? How do we leverage science, technology and innovation to achieve and maintain food security?



ICT Infrastructure Expansion

How do we increase internet and wireless access/penetration to 70-90%? How do we build the physical and software infrastructure? What technologies and innovative approaches can we leverage to attain a strong and reliable infrastructure? What innovations and technological solutions are available to make internet and wireless services affordable to the broader mass?



Large-Scale Urbanization

How do large cities like Addis Ababa grow and at the same time address displacement of farmers? What is the role of technology here?



STEM Education, Workforce Development & Employment

How do we scale-up access to higher education and find employment to the tens of graduating young men and women? How do ensure the quality and type of education will enable the next generation better equipped to succeed?



Sustainability and Environmental Issues

How do we address pollution and climate change pressures on the Rift Valley Lakes, Lake Tana, and the major rivers?



Transportation Infrastructure

What is the optimum combination of transport modes that scales well and performs efficiently for the Ethiopian case?

PLENARY SPEAKERS

H.E. Dr. Seleshi Bekele (Min of Water, Irri & Elec)

H.E. Dagmawit Moges (MoT)

H.E. Dr. Eyob Tekalign Tolina (State Minister, PM Office)

KEY NOTE SPEAKERS

Dr. Debrework Zewdie (Over-arching theme, USA)

Professor Asfaw Beyene (Climate Change, USA)

Eng. Tadesse H/Selassie (Water & Food Sec, ET)

Professor Fetien Abay (Food Security, ET)

Professor Sossina Haile (Energy, USA)

Professor Meskerem Tadesse (Policy, U West, CA, USA)

Ato Messay Amerga (ICT, Apple, USA)

Professor Desalegn Rahmato (EAS, ET)

Dr. Zegeye Chernet (EiABC, ET)

Dr. Fisseha Mekuria (South Africa)

Professor Mammo Muchie (South Africa)

Professor Brhane Gebre Kidan (Food Security, ET)

Professor Tegegne G/Egziabher

Dr. Guebre X. Tessema (USA)

Professor Joseph Beyene (Health Sector, Canada)

Professor Desta Mebratu (South Africa)

Professor Sisay Asefa (W. Michigan U, USA)

Professor Tesfaye Teshome (Unity U, ET)

Dr. Tewabech Bishaw (Health Sector, ET)

Professor Shifferaw Taye (ET)

Attorney Rebecca Haile (USA)

Architect Fasil Ghiorghis (ET)

This page is intentionally left blank.



ACCESS TO CLEAN WATER

Supply of water to urban areas like Addis is dwindling. The competition for water access in arid areas like the Afar and Ogaden will eventually reach crisis stage as pressure from increasing populations mounts.

SPEAKER'S PROFILE



**SELESHI BEKELE
AWULACHEW**

Minister of Water,
Irrigation and Energy,
Ethiopia

Dr. Seleshi Bekele Awulachew, Ethiopia's Minister of Water, Irrigation and Energy, has 30 years of experience in leadership, research, teaching, and advisory work in the areas of water, energy, land, climate change, capacity development, and policy. The Ministry has an ambitious portfolio of creating 100% access to electricity by 2025 and advancing water supply and sanitation in one of the most rapidly growing developing countries in Africa. Ethiopia is putting in place the unique development partnership models for achieving rapid water supply and sanitation targets, as well as water for advancing rapid irrigation development to ensure national food security. Ethiopia is currently developing the biggest hydropower dams in Africa, which will generate 6,000 megawatts.

Dr. Bekele Awulachew worked at the UN headquarters in New York as Interregional Advisor in the Division of Sustainable Development in the Department of Economic and Social Affairs (DESA). He first joined the United Nations System, where he worked for the Economic Commission for Africa (UNECA) as a Senior Water and Climate Change Specialist. At the United Nations, he contributed to mainstreaming sustainable development in national development plans of the member states in Africa, Asia, Latin America, and the Caribbean. Previously, for seven years, Dr. Bekele led the regional office of the International Water Management for the Nile Basin and

East Africa, where he also served as a Senior Researcher, based in Addis Ababa. He developed this office from a small group into a major regional research hub, which still flourishes today. He also acted as a lead editor of the first comprehensive book on the Nile Basin, Nile River Basin: Water, Agriculture, Livelihood and Governance, coordinating the efforts of over 45 scientists from Africa and other regions. Early in his career, Dr. Bekele Awulachew was Dean and CEO of the Arba Minch University in Ethiopia, where he established graduate programs in dams and hydropower, irrigation and drainage, water resources and hydrology. He taught courses in hydropower, water resources, watershed management, and environmental impact assessment in Ethiopia and Germany.

He was educated as a civil engineer at Addis Ababa University and received his master's degree in hydraulic engineering and hydrology at the University of Newcastle upon Tyne, United Kingdom. He holds a PhD in water resources and hydraulic engineering from Dresden University of Technology, Germany.



EYOB BERHANE

After graduating in Civil Engineering from College of Engineering, Guindy Madras, India, in 1984 joined Ethiopian Water Resources Development Authority and worked as a Hydraulic Design Engineer in Anglele Bolhamo and Gode Irrigation Projects. In 1988 was appointed as Resident Engineer for the general construction supervision and contract administration work of Gode Irrigation Development Project. Meanwhile, attended a post-graduate course on Environmental Hydrology at Cairo University, Egypt. In 1995 was appointed as Project Engineer for Gode Multi-Purpose Development Project. Starting from late 2003 to early 2007 was working as a project management team member for Genale-Dawa Master Plan Study Project. Currently is Managing Director of YESHI-BER CONSULT.



DR. SEMU MOGES

Dr. Semu Moges is currently Adjunct Associate Professor in School of Civil and Environmental Engineering at University of Connecticut. He is a hydrologist by training and had previously taught water resource management and hydrology courses at Arba Minch Institute of Water Technology. He received his PhD and MSc degrees from University of Dar es Salaam, and BSc from Arba Minch Water Technology Institute, Ethiopia.



ABSTRACTS

Grand Challenges & Potentials of Ethiopia's Water Resources by 2050

Engineer Eyob Berhane

Though Ethiopia is endowed with substantial amount of surface and ground water, presently it is facing acute shortage of food, water supply for industrial and consumptive use. This is mainly due to lack of attention to harness the country's surface and ground water by the Government.

Population growth, urbanization and industrial growth yet pose a great challenge at present and in the coming 40 years. Equivalent with this most of the rivers that originate from the highland of Ethiopia culminate in to neighboring countries, needless to mention the necessity for prudent planning and equitable utilization of the resource with neighboring countries in the horn of Africa.

Unless the government give due attention for the development of the country's water resources the problem will continue and will reach a critical level by 2050. Further, with a population of about 200 million, by 2050, the demand for water and food security will reach a dangerous stage where water will be the center of gravity for Ethiopia's politics.

Historically modern water resource development for water supply, hydropower and irrigated agriculture is not new to Ethiopia. Among others, during the imperial era large scale irrigation projects such as Wonji, Metehara and Amibara had been implemented and were benchmarks to encourage the Derg government to start additional large scale projects like Angelele Bolhamo, Melka Wakena hydroelectric dam and Gode irrigation projects. Subsequently, we are witnessing the aggressive action of the present government in developing huge irrigation projects like Tendaho, Kesseme, Kuraz and Omo. Parallel with these, hydroelectric projects like, Tekeze, Gibe-I,II & III as well as cascade of hydro power projects on Genale river and the Grand Renaissance dam on Abay river are under construction.

Ever since the draught of the early 70s the government had been striving to harness the water resource potential of the nation. To date, the major river basins of the country had been studied at a master plan level. Although at snail speed, the nation has started to utilize this important

and significant resource for the wellbeing of its people (particularly for water supply and irrigation).

Despite having great water resource potential in many parts of the nation acute shortage of water is observed be it for domestic consumption, irrigation and other uses. This situation is worse in the arid and semi-arid areas like the Ogaden, Afar and other dry basins.

Most of the country is rural with week town structure. From what we are witnessing, in the coming 40 years built-up areas and towns will grow tremendously. Whatever new rural development strategies are implemented traditional agriculture alone cannot solve existing demographic issues.

With this regard, what is at stake in the coming 40 years is the presence of good professionals at all levels and having reliable data at their disposal. Implementation of water resources projects depends on financial and managerial potential in regional and federal governments. If this does not exist no project can be properly planned, executed and operated.

Sustainable development is based on human potential and human potential can only be mobilized through proper training and information. It is here where the nation's education system should be geared towards the need of the industry.

In this paper it is attempted to bring one of the grand challenges of the nation by 2050 "Water Resource" at the front so that policy and decision makers could have an insight on this significant natural resource its challenges and potentials by 2050.

This paper is prepared based on secondary data and information. Except for some empirical and first hand information from the author, the paper is based on the various river basin master plan study documents and works of other senior professionals.

Scenario Analysis of the Prospect of Water-Energy-Food (WEF) Security in Ethiopia by 2050

Megersa Tesfaye, Addis Ababa University, Ethiopian Institute of Water Research (EIWR)

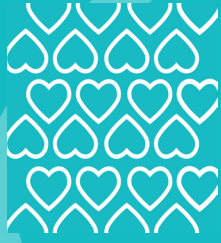
Semu Moges, Connecticut University of Connecticut, School of Civil and Environmental Engineering , Corresponding

This paper attempts to study the prospect of water-energy-food security of Ethiopia by 2050. under three development scenarios - Business as Usual (BAUScen), Revised Vision 2030 (RV2030Scen) (achieving lower middle-income country status) and Agricultural Intensification Scenarios (AGRIScen) (doubling crop productivity per hectare). The analysis was done using Climate Land Energy Water Systems (CLEWS) modeling framework. The study indicated Ethiopia has adequate water and mix of renewable energy resources to develop and satisfy the growing demand until 2050. In terms of food production, land-expansion based agriculture is no longer

tenable to practice as well as satisfy the growing food demand under the current level of productivity. Ethiopia needs to promote a Marshall plan type of investment and capacity building plan over the coming 10 years to develop and attain sustainable water, energy and food security, and sustain ecological integrity through 2050. Delayed investment in WEF energy resources may likely aggravate social-economic challenges and destruction of ecosystem integrity. This research is an indicative and additional pressure coming from climate change and delayed impact of investment is not yet included.



NOTES



ACCESS TO HEALTH CARE

What are the innovative approaches and the role of preventative health services?

How do we build a scalable healthcare system?

What are the best practices to develop and sustain an accessible and affordable health care system?

SPEAKER'S PROFILE



**DEBREWOK
ZEWDIE**

Professor, City
University of New
York

Dr. Debrework Zewdie is a Distinguished Scholar/Visiting Professor at the Graduate School of Public Health and Health Policy at the City University of New York, and was a Senior Leadership Fellow at Harvard University's T.H. Chan School of Public Health where she developed a course on Leadership in Public Health. She was the Director of the World Bank's Global HIV/AIDS Program articulated the Bank's HIV/AIDS strategy and lead the first billion dollar multi-country HIV/AIDS Program that changed the AIDS funding landscape. Dr. Zewdie was Deputy Executive Director (2010-2012), and Deputy General Manager (2012-2013) at the Global Fund for AIDS, Tuberculosis and Malaria where she was part of the team that lead the transformation of the Global Fund. She has a PhD on Clinical Immunology from the University of London, is a recipient of multiple honorary degrees, serves on several non-profit Boards and has published several papers and book chapters.



JOSEPH BEYENE

Professor, McMaster
University, Canada

Dr. Beyene is a Professor of Biostatistics and the John D. Cameron Endowed Chair in the Genetic Determinants of Chronic Diseases, Department of Health Research Methods, Evidence, and Impact, McMaster University. He received his BSc degree in Statistics from Addis Ababa University; MSc in Statistics from the University of Guelph, Canada; and a PhD in Biostatistics from the University of Toronto, Canada. Dr. Beyene's research focuses on statistical methodology development and application relevant to public health sciences, clinical medicine, and biomedical sciences. His scientific collaboration areas span a wide range of disciplines including maternal-child health, nutrition epidemiology, oncology, and cardiovascular diseases. He has authored or co-authored over 340 peer-reviewed scientific articles and book chapters across the areas of his training and research interest. Dr. Beyene is also active in supervision of post-doctoral fellows, as well as PhD and MSc-level graduate students.



YEMANE BERHANE,
MD, MPH, PHD

Senior Professor of
Epidemiology and
Public Health
Director of Addis
Continental Institute
of Public Health.

Yemane Berhane is a Professor of Epidemiology and Public Health. He has Doctor of Medicine and Master of Public Health from Addis Ababa University and a PhD in Epidemiology and Public Health from Umea University, Sweden. He directed the Addis Continental Institute of Public Health since its inception in 2006. He has authored and co-authored more than 300 scientific works in collaboration with national and international researchers. He has co-edited four books: the 'Epidemiology and Ecology of health diseases in Ethiopia', two editions of the 'Epidemiological Synthesis of HIV/AIDS in Ethiopia', and 'Reproductive and Child Health with Focus on Ethiopia and other Developing Countries'. He has received many recognition and awards; the latest was the Honorary Doctorate, Doctor Honoris Causa, awarded by Uppsala University, Sweden, for outstanding scholarly contributions and promoting research in Ethiopia and internationally.



YAYEHYIRAD KITAW
MD/MHP

Yayehyirad Kitaw MD/MPH (France) Services: Head & Associate Prof, DCH, AAU 1971-1984 (intermittently); Head, Health Service DTC Campaign 1976-1977; Commissioner, Higher Education (1977-1979); Head/Minister, ISEN (1984-1987); Minister MOE (1987-1991); national & international consultant, 1993-. Member: EMA; EPHA; EMPA; Fellow EAS

Winner: WHO, Medal, research in Social Medicine 1984; EPHA, PH Service Award, 2007; Gold Medal for academic service, 2014, SoM and SPH, AAU; EMA, 2015.

Publications: over 60 papers - in peer-reviewed Ethiopian & international journals. Author of several books; most recent include: a) "Old Beyond Imaginings: Harmful Traditional Practices in Ethiopia". 2008; b) The Evolution of Public Health in Ethiopia: 1941-2015.; c) The Evolution of Human Resources for Health in Ethiopia: 1941-2010, EPHA, 2014.

Committees: EAS; Urban Health Think Tank. FoM, AAU; WHO-AFRO; League of Red Cross & Crescent Societies'; Medical Committee of ESC; CAF & FIFA.



DR. TEWABECH
BISHAW

Dr. Tewabech Bishaw is a passionate Public Health Specialist with over 40 years of national, international and global work in public health leadership, program design, management, strategy and policy development, training and human resource development, advocacy, and institutional and community capacity strengthening. She is a human rights advocate, gender and culture sensitive social entrepreneur who was born in Jimma, Ethiopia, and whose career began as a primary school teacher.

Dr. Tewabech is the Founder and Managing Director of Alliance for Brain-Gain and Innovative Development (ABIDE), a pioneer Ethiopian NGO that focus on facilitating brain-gain and knowledge exchange for human resource, community, institutional and national capacity building. ABIDE works in and outside the county to advocate, mobilize, link and effectively engage the Ethiopian Knowledge Diaspora with institutions and professionals in the country for systematic and sustainable two-way knowledge exchange and technology transfer. Prior to this, Dr. Tewabech worked for over 20 years in UNICEF in four different countries and several varying functions, as the Country Deputy Director in Botswana, with emphasis on HIV/AIDS prevention care and management; as Programme Director in Namibia with a focus on Health, Nutrition, Water and Sanitation; as Chief of Health Programs and Programme Director for Child Survival and Safe Motherhood Programme in India, and in Ethiopia, as Chief Health Programme for National Accelerated Maternal and Child Health Services.

Before joining UNICEF, she served for over 15 years in the Ministry of Health in Ethiopia, first in Health Services Provision and Program Management at the sub-national level and later in Senior Management and Executive Leadership positions at the national level. In the latter function, she was responsible for Disease Prevention and Control, Integrated Maternal and Child Health Services, Training and Health Man-Power Development and Health Education programmes and establishment of the Health Learning Material Production for the sector as well as conceptualizing and leading the establishment of what was then "Jimma Institute of Health Sciences" an integrated community focused public health team training institute, now the Jimma University.

Dr. Tewabech was a co-founder and leader of the Ethiopian Public Health Association, the African Federation of Public Health Associations, the Society of Ethiopian Women in Science and Technology and the Society of Ethiopian Women against AIDS. She is actively engaged as an International Board of Governors for AMREF Health Africa, and is a member of the Governing Council of the World Federation of Public Health Associations. She also serves as Board Member for Mekelle University and as Advisory Council member for Ethiopia Ministry of Science and Higher Education and as Think Tank Group member for the International Institute of Primary Health Care-Ethiopia. She serves in a number of Technical Advisory Committees in the World Health Organization, Africa Region, and active member of on Health Services Research, Human Resources Development for Health and on Immunization.

In 2012, Dr. Tewabech was nominated as one of the Top Ten Ethiopian Women of Excellence by the Association of Ethiopian Women in Business (AWiB). She was also nominated by the Ethiopian people in 2013 as an Inspiring Ethiopian recognized for her leadership and pioneering role as a woman in public health. In 2015, she was given an Award of Recognition by the Ethiopian Government for her contribution on Diaspora Engagement for Ethiopia's development. In 2018, Dr. Tewabech received AWiB's Lifetime Achievement Award. Internationally, she was nominated and included in the Top 100 Women Leaders in Global Public Health through a campaign organized by the Global Health Program of the Graduate Institute, Geneva.

Dr. Tewabech Bishaw holds a Bachelor's degree from Addis Abeba University Gondar Public Health College, Master of Public Health, Diploma in Health Education as well as a Dr. of Health Sciences degree, both from Loma Linda University School of Health, Loma Linda, Ca. USA. She is grandmother to five grandchildren.
April, 2019.

Ethiopia 2050: Overarching Theme

Dr. Debrework Zewdie

The Ethiopia 2050 Grand Challenges and Opportunities Conference presents a timely occasion for Ethiopia to harness its demographic dividend for sustained economic growth, provided investments are made to reduce underlying disparities and policies are put in place to form collaborations between health education and related sectors.

Today Ethiopia claims the proportion of people below the poverty line has been halved; the prevalence of hunger and undernourishment has been reduced; access to education has expanded; the gap in enrolment between boys and girls has narrowed; under-five mortality has been reduced by two-thirds; and similar progress was recorded in reducing HIV/AIDS, malaria, tuberculosis and other diseases. As of 2015, Ethiopia successfully achieved six of the eight Millennium Development Goals. However the economic growth has not been wide ranging and recent expansion and rapid growth over the past decade has overburdened the education and health systems and created a slew of new problems such as stagnation in quality and learning outcome and increase in non-communicable diseases.

Ethiopia has one of the highest fertility rates and the highest rates of maternal deaths and disabilities in the world. 67% of women in the 15-49 age group have no formal education, and a one-in-52 chance of dying from childbirth-related causes each year. More than 60% of infant and 40% of under-five deaths are neonatal deaths. 60-80% of communicable diseases are attributed to limited access to safe water and inadequate sanitation and hygiene services.

This conference focuses mainly on technological fixes, which Ethiopia needs to exploit. However, in a country where 70% of the population has no access to electricity (with only 24% of primary schools and 30% of health centers have access to electricity), nearly half of Ethiopians get their daily water from unclean sources (with only 15% having access to improved toilet facilities), and an 18.6% internet penetration (with the lowest smartphone ownership in the world at less than 5%), a technological leap becomes a daunting task. Particularly when coupled with the absence of consistent good governance.

Ethiopia, is in a position to harness its demographic dividend for sustained economic growth, provided investments are made to reduce underlying disparities and policies are put in place to form collaborations between health and related sectors. This presentation will focus on access to services, population health, and education levels, while raising questions about the existing infrastructures and efficiency and the critical role of good governance. It will draw on lessons learned in other countries, and close with recommendations to accelerate transition and make the most of the demographic dividend.

Grand challenges, methodological issues and the way forward in promoting context-based evidence-based practice in Ethiopia

Dr. Josph Beyene

Systematic reviews and meta-analyses are increasingly being used in a wide range of applications including biomedical sciences, agricultural sciences and the social sciences. Meta-analysis is the use of statistical methods that allow synthesis of research findings across studies. Rigorous evidence synthesis methods are crucial to generate the best available evidence on a given topic and address important scientific questions. Knowledge translation, policy decisions, and implementation must be informed by properly synthesized evidence. An understanding of fundamental principles of meta-analytic statistical methods commonly used in systematic reviews is critical for proper interpretation of synthesized research evidence. I view meta-analysis as a special case of a broader data integration task whereby diverse data sets can be synthesized to answer important scientific questions. Data integrative approaches are critical to combine diverse data at various levels including at the molecular, clinical, community, and the larger public health setting.

Due to rapid advances in technology, wealthy nations are generating BIG and COMPLEX data at an unprecedented pace and they're now investing heavily on methods and tools to effectively mine these datasets in a wide range of sectors including education, economics, health, agriculture, national security and so on. Data can be generated in many ways and varies in time it takes and money needed to generate. For example, inception cohort studies such as longitudinal birth cohorts offer great opportunity to monitor and understand trajectories of health outcomes of children over time. Similarly, following a cohort of older adults from a certain age will provide useful information on aging process and risk factors associated with aging.

Both acute and chronic health problems are increasing in Ethiopia. As the demographic composition and lifestyle of the public changes, non-communicable chronic diseases will become more common in the next 30 years. These changes will pose many challenges to individuals, community, and society at large. A proactive and data-driven evidence-synthesis approach must be used to inform policy and decision makers so that they can support the implementation of effective prevention, diagnostic, treatment and management interventions based on the best-available evidence. I will argue that the best evidence-based approach should be based on a collaborative model including subject-matter experts, methodologists, policymakers, trainees and knowledge users. A collaboration involving academia, government and private is also critical to facilitate data generation, storage, synthesis and translation of knowledge.

In this talk I will draw experience from the culture of my institution (McMaster University), ranked several times as the top research-intensive University in Canada, and last year ranked 2nd in the world in a new international ranking by The Times Higher Education that recognizes the impact universities are making in their own countries and on a global scale. The Times Higher Education Impact ranking is based on the Sustainable Development Goals (SDGs) adopted by the United Nations which are designed to address the most serious challenges of our time.

Health Technology for Increasing Access to Health Care in Ethiopia

Dr. Tewabech Bishaw: Dr.HSc, MPH, DHED

The UN Declaration on Human Rights stipulates that everyone has the right to a standard of living adequate for the health and well-being of themselves and their family, including food, clothing, housing, medical care, and necessary social services, and the right to security in the event of unemployment, sickness, disability, widowhood, old age, or other circumstances beyond their control. It further specifies that the enjoyment of the highest standard of health is one of the fundamental rights of every human being without distinction of race, religion, political belief, and economic or social condition. In this regard, Ethiopia, as a member of the UN family, is signatory to these guiding principles and protocols, and it has, accordingly, continued to strive to align its national health policies, strategies, and health service systems to achieve the highest standard of health for all its citizens.

Development of Public Health in Ethiopia

The period between 1941- 1953: Ethiopia established its Ministry of Health in 1948.(1) It first started by rehabilitating and reactivating the few existing, war-torn health facilities that were primarily owned by missionaries. Its primary goal was epidemic control activities through these health facilities. In 1953, the University College of Addis Abeba was opened under the Ethio-American agreement, and the first batch of Ethiopians who were being trained abroad returned to the country to resume their medical education (2). In 1954, with the collaboration of WHO, UNICEF and USAID, the Gondar Public Health College and Training Center was established to train mid-level health workers - health officers, community nurses, sanitarians and laboratory technicians (3) to serve the population in rural Ethiopia. Between 1941 and the early 1950s, the number of hospitals increased from 20 to about 50, and these facilities provided curative services. During this period, with an estimated population of about

15 million, coverage of health services grew from 10% to 25 %.(4)

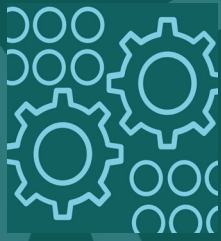
The Period 1953 – 1974: During this period, Ethiopia implemented the Basic Health Services Approach, expanding and consolidating health stations, health centers and hospitals.(5)In these facilities, health services emphasized promotive, preventive, curative care and specialized services, primarily epidemic control, and control of communicable diseases. According to the Ministry of Health statistics, in 1974, there were 85 hospitals, 8415 hospital beds, 93 health centers and 650 health stations serving the population of an estimated 28.7 million people. The approximate health service coverage level reached 30%, primarily serving the urban population (6) Specialized disease control programs, such as and smallpox eradication, and control of tuberculosis, leprosy and sexually transmitted infections were implemented while also strengthening nutrition programs by establishing the Ethiopian Nutrition Institute.(9)

The Period 1974 – 1990: In this period, Ethiopia adopted and implemented the Primary Health Care (PHC) Strategy with the aim to achieve health for all by the year 2000. In 1974, following the Ethiopian revolution, the country transitioned to a socialist political orientation with marked changes in the country's socioeconomic and political reality. The health services system continued to expand to reach larger rural population. A major landmark was not only the strengthening of hospitals, health centers and specialized services, but also the introduction of Community Health Services with the training of Community Health Agents (CHAs) and Traditional Birth Attendants (TBAs) as voluntary workers to contribute to the population's needs at the grass roots level.

More on www.ethiopia2050.com



NOTES



ADVANCED MANUFACTURING

How do we prepare Ethiopia for Industry 4.0 with advances in intelligent manufacturing, additive manufacturing, and related manufacturing technologies?

SPEAKER'S PROFILE



ASEGED MAMMO
HABTEGABRIEL

Aseged Mamo has an MSc. In Metallurgical Manufacturing Processes and Management from the University of Birmingham, UK, 1987 and a BSc. Mechanical Engineering, Addis Ababa University (AAU), 1976. He is a mechanical engineer and metallurgist and has been with Ethiopian engineering industry for the last 25 years. He was Deputy Director of the Basic Metals and Engineering and Industries Bureau/Agency at the PM Office and was its first Technical Director in the Transitional and, later, the Federal Government of Ethiopia responsible for all public industries, including those of the Military. I also served as Board Member and Manager of several firms.

In the Water Sector, he has worked as an R&D engineer to develop rural pumping devices mainly on Hand pumps. Notable output of the program is the concept of user maintenance, later dubbed Village Level Operation and Maintenance. Design, fabrication and launch of the Afridev handpump was his conclusion. He is now a freelance consultant in Industry and Water Sectors.



ASMAMAW TADEGE
SHIFERAW

Associate Professor
of Project
Management

Asmamaw Tadege is an associate professor at the Norwegian University of Life Science. He was educated at the Norwegian University of Science and Technology (NTNU) where he did PhD in Project Management & Construction Engineering (2013), and an MSc in Civil Engineering from AAU (2007).

Asmamaw has over 20 years of experience in civil engineering. He has worked as a researcher, contract administrator, construction manager and as procurement specialist. Before moving to Norway, Asmamaw has worked as practicing engineer for about 10 years at different organizations in Ethiopia, including the Ministry of Works and Urban Development.

In 2009, he joined NTNU as research fellow and involved in a research program that focuses on the governance of major infrastructure projects in Norway, Netherlands, and England and published several articles.

From 2013 – 2018, he served as senior engineer at the Norwegian Public Roads Authority.



SEIFU ARGAW
BEKELE, PhD

Seifu is the Principal Engineer for Global Wind Technology Services. He is responsible for the development of wind engineering and computational fluid dynamics. He previously has been a principal wind engineer for the Building and Infrastructure Division of Vipac Engineers & Scientists. He has extensive experience in wind engineering consultancy of structural, cladding, environmental and microclimate study worldwide.

Dr. Bekele works ranges from experimental to computational fluid dynamics. A few of his projects include the Peninsula Hotel Chicago, Torre Espacio Madrid, Sharm El Sheikh Airport Egypt, Dubai Cricket Stadium, Keppel Bay Towers Singapore, Millennium Towers Bangkok and Central Park Jakarta.

His articles have been published in various journals. He has also presented at various conferences in Europe, Canada, USA, Asia and Australia. He has given technical seminars for engineers and architects in Hong Kong, Taiwan, Manila, Kuala Lumpur, Singapore, Jakarta, Bangkok and Dubai.



MATIAS TAYA

Industrial Consultant
& Trainer

An Industrial Consultant, Trainer and Technologist in the area of industrial system design, improvement, operations and asset management, with more than 14 years of experience in consulting, implementing, researching and teaching at different universities and companies both in Europe and Ethiopia. I am a mechanical engineer with a B. Sc. in Mechanical Engineering from Arba Minch University, Ethiopia (2004) and my post graduate study focused on Industrial Systems and Asset Management from Linnaeus University, Sweden (2009). My areas of expertise include: Cleaner production, Energy Audit & Management, Resource Efficiency, Organizational Change Management, KAIZEN Implementation, Asset Valuation, Project Feasibility & Investment Analysis, Industrial Operations and Supply Chain Management, Maintenance Management and Management Systems Implementation (ISO standards).

Advanced Manufacturing Challenge in Ethiopia

Asseged Mammo

Background: Following the EPRDF take over, various corporations in Ethiopian Industry were dissolved as their expenses were covered by public companies. This resulted in the loss of accumulated knowledge in the respective fields. Dissolving the NMWC (National Metal Works Corporation) was last and it was communicated to Transitional Government officials its dissolution would be a great loss if meaningful growth in industry was expected. Officials heeded the advice, set up a multidisciplinary team from public and private sectors and the result was a document "Strategy for the Development of the Ethiopian Basic Metal and Engineering Industrial Sub-Sector"; the BMEI Bureau was also created to put it to practice. Unfortunately, following changes in Government and policies, the Bureau was reorganized several times; the document was subsequently neglected and/or abused the last 25 years. Despite many of its contents may be out of date, the Strategy Document needs to be updated and put to practice as its approach and core recommendations are still valid today. Following are the topics specifically raised by the organizers of the Ethiopia_2050 Challenge.

Clusters and Industrial Parks (IPs): Natural and Induced clusters exist in Ethiopia. The number of Ethiopian and foreign built IPs is increasing. Induced clusters are necessary for rapid industrialization, but require a good policy environment which we don't seem to have yet. China is Ethiopia's main collaborator in IPs; it has deliberately used IPs and Special Economic zones as a venue to experiment with reforms and new policies. Let us genuinely learn from China. There need to be Ethiopian private sector owned IPs. Let us also use IPs to establish new urban centers.

Green Manufacturing: Ethiopia is Green as far as major sources of power are concerned. The vast majority of Ethiopian power is from renewable sources. Local manufacture and/or assembly of PV, solar thermal and wind power units should be considered. There are too many interruptions and hence distribution problems need to be solved. The turn-key approach to power projects has so far not benefitted Ethiopian companies; distribution work should hence be done by them.

Gig Economy: Even the old labor law was acceptable for short term contracts. The new investor friendly law has been promulgated and should be good for Manufacturing. Its acceptance needs to be seen when copies are distributed.

Industry 4.0 is too far away for us to care. The main challenge for Manufacturing in Ethiopia now is to productively use existing and virtually idle machinery to build other machines. Manufacturers need a genuine policy environment wherein they should be given priority over imports. So many investors bring their used machinery they kill incentives of local machine building AND participate in capital flight by over estimating their machines' values. The workings of Industry and Trade should be separated as Trade (people with lots of cash) always prevail over Industry, people who have invested a lot locally.

Instance of Machine Building in Ethiopia made over 30 years ago was included to alleviate apprehension of decision makers that local capacities and capabilities exist. Now we have "Akaki Machine Tools Factory" and many more engineers and technicians.

Effective governance for major projects: A mainstay of good public investments

Matias Taye (Industrial Operations & Energy Expert) & Tesfaye Chalchisa (Environmental Scientist & Technologist)

In today's market, manufacturing companies are expected to produce products with competitive value proposition and prices at a rate that is in phase with the changes in these requirements. Moreover, they are simultaneously expected to be part of and actively contributing to, a socially, environmentally and economically sustainable planet. The textile sector, as a major sector in the economy, with increasing trend and substantial resource needs is redefining the entire value chain be responsive to the changing sustainability requirements of the value chain actors. In this regard, strategies such as resource efficiency (RE) and circular production (CP) have taken the

center stage so as to enable organizations accelerate growth, enhance competitiveness and mitigate risk. This paper describes what RE & CP strategies are and the needs for such interventions in today's manufacturing ecosystem. In addition, the paper presents a summary of the findings of RE assessment performed at five textile factories in Ethiopia. In summary, the motive of this paper is to shed some light on the implications of the RE & CP strategies, share the lessons learned and explore on the future potentials of the area of concern, resource efficiency and circular production.

Effective governance for major projects: A mainstay of good public investment

Asmamaw T. Shiferaw

Major investment projects (if successful) have a significant effect on the societies in which they are implemented and can boost long-term economic output, but they are also problematic if they fail. Massive amounts of public money can evaporate in one or two projects, and that can destroy the public finances of a small economy. Over the past few decades, many major public investment projects have been implemented worldwide, and there has also been a tidal wave of interest in new investments. However, the preparation and implementation processes of several of those projects have sparked debates, and the effects of some of the projects have been a disappointment, because they misfired and became white elephants. A white elephant project, which usually involves national pride, produces little or nothing of value compared to its investment. At the same time, it prevents the rise of small projects and sucks up resources for a very long time. In an effort to understand how large public investment projects are being prepared in Ethiopia, the author has conducted an inquiry into the country's project preparation

and decision-making processes. The findings indicate many shortcomings: limited or no use of a formal project governance system, a lack of distinction between the actual decision and decision analysis, a strict top-down approach, a culture of overlooking project-related risks, exaggeration of project benefits during the starting phase, and optimism bias. These are major pitfalls and represent potential threats to the success of investments in the coming years. In this article, the author discusses an improvement option for the country's project governance system and recommends that no matter how eager we are to transform the country, we should not rush to implement large and complex projects that involve several unclear risks and consequences. Priority should be given to setting up political and technical gatekeeping mechanisms – go/no-go stages – that can stop bad projects before they are conceived. At the same time, such mechanisms enable valuable project concepts to be selected, implemented and intelligently inserted into the country's fabric, and to be linked with other prime streams of development.

Indigenous African Knowledge and Science Inclusion in the Education System

Mammo Muchie: DST/NRF Research Professor
on Science, Technology and Innovation, Tshwane
University of Technology, Pretoria, South Africa

Though the degree of severity is staggering the challenge of housing is evident globally. The dilemma faced by any state operator is how to balance and harmonize the human habitat development and limited resources in equity. Many nations enshrine housing development in their policy with a strategic plan framework; country wide; to keep every citizen on board. In some, such practices do happen rarely. In which case, a certain segment of the population will be left far behind. For such states the wake-up call may be felt very late; by which time, situations might have gone far beyond reversibility by any remedial measure. In Ethiopia , the housing situation in the rural was not given a policy coverage (if not mistaken) until the GTP I and GTP II plans, where it stated that, rural housing is 3,400,000 and the urban including Addis Ababa is 1,500,000 within the period of 2015/16-2020/21; per the 2014 Ministry of Urban Development and Housing Construction (MoUDHC) report. Though not sure of the progress made, time is speeding up. To straighten up the ambitious popular plan, specifically, that for the rural domain, available alternatives have to be critically evaluated. One of such alternatives could be amended compressed

earth block (ACEB). The research postulated as: "amending a given natural soil with lime and powdered pozzolans in the presence of optimal amount of water could be an improvised building material" had achieved a positive result both in compressive strength and durability (water attack) terms; in reference to international earth construction normative. It is thus, juggled as a better performing wall making block and mortar for earthen construction. The lengthy process has gone through the following three profound phases; intensive laboratory synthesis, public outreach pilot project construction, acquire a patent confirming an innovative construction product and publish a paper in a scientific journal of international reputation to herald the success. This article is presented here to introduce the finding that could be a catalyst in alleviating the housing and environmental challenges that Ethiopia is going to face by 2050. The paper covers the progress made so far and provokes with a plan to promote the ACEB construction input at a small scale production level; and thereby, to stand as an environmental steward for the highly coveted flagship of "ETHIOPIA 2050 – Grand Challenges & Opportunities".



NOTES



ENERGY DEMAND

How do we develop an integrated approach to sustainable energy management?

How do we scale-up energy generation and distribution, with particular focus on sustainability and renewable resources in mind?



SPEAKER'S PROFILE



DR. ASFAW BEYENE

Dr. Beyene is Professor of Mechanical Engineering at San Diego State University. He also serves as Director of the Center for Renewable Energy and Energy Efficiency at SDSU.

He earned his doctorate degree from Warsaw University of Technology in Mechanical and Aerospace Engineering, specializing in jet engines. He joined SDSU in 1989. Dr. Beyene's research integrates analytical, computational, and experimental techniques to address fundamental and practical problems of energy. His specific research interests include thermodynamics and renewable energy, with emphasis on modeling and experimental analyses. His invention, a flexible wind turbine blade, has been received enthusiastically across the world, reported by Science in February 2017. Over the years, Dr. Beyene has attracted about \$10,000,000 in funding from NSF, DOE, US Navy, CEC, and others. He has published over 120 articles in various peer-reviewed journals and proceedings.

Dr. Beyene has received several honors for his scholarship, including distinguished faculty Award, Outstanding Faculty Award of SDSU, Outstanding contribution from Department of Energy, Energy Developer of the Year by Association of Energy Engineers, ASME's Best Paper Award, and many others. He has chapters including two in well-known books: Handbook of Mechanical Engineering and Mark's Handbook. He is Fellow member of the American Society of Mechanical

Engineers. He is Associate editor of ASME's Journal of Energy Resources and Technology, Guest editor of Journal of Applied Energy, Guest editor of Energy - the International Journal, Guest editor of Journal of Energies, and partakes in many other editorials. He has delivered several invited and keynote speeches in the U.S. and overseas. Prof. Beyene is Fellow member of the ASME.



SOLOMON ABEBE ASFAW, PHD

Solomon Abebe Asfaw, PhD, received his undergraduate degree in Physics from Bahir Dar University, Ethiopia; M.Sc. in Physics from Norwegian University of Science and Technology, Norway; and another M.Sc. and a PhD, both in energy system modeling from Ben-Gurion University of the Negev, Israel. He was a recipient of the 2010 Wolf foundation prize for outstanding PhD students in Israeli Universities. He was a postdoctoral researcher at the University of California-Berkeley, supported by a fellowship grant from Philomathia foundation. Then, he moved to Addis Ababa University (AAU), where he worked as an Assistant Professor of Energy Systems and the head Center of Energy Technology. Currently, he is a senior researcher at Lappeenranta University of Technology, Finland. His research interest is in the area of energy transition and the question of power system planning and optimization, particularly in addressing the challenge of variable renewable energy (VRE) integration and energy storage. His findings are published in various journals and as a part of books.



ATSEDE GUALU
ENDEGNANEW, PhD

Atsede G. Endegnanew received her B.Sc. degree in Electrical Engineering from Mekelle University, Mekelle, Ethiopia in 2007, and her M.Sc. and Ph.D. degrees in Electric Power Engineering from the Norwegian University of Science and Technology, Trondheim, Norway, in 2010 and 2017, respectively. She has worked as a research scientist at SINTEF Energy Research, Trondheim, Norway for 9 years and has produced more than 30 scientific publications from her research work. Atsede has extensive experience in designing and analyzing large power systems and large scale integration of renewables (wind, solar, hydro, etc). Her areas of interest and specialization include power system analysis, control and dynamics, HVDC systems, renewables and distributed energy sources. She is currently working as a power system consultant in Addis Ababa, Ethiopia and is also the chairperson of Ethiopian Women in Energy Association (EWiEn).



PROFESSOR SOSSINA
M. HAILE

Sossina Haile received her B.S and Ph.D (1992) from the Massachusetts Institute of Technology, and M.S. from the University of California, Berkeley. She carried out postdoctoral research at the Max Planck Institut für Festkörperforschung [Institute for Solid State Research], Stuttgart, Germany (1992-1993) as a Humboldt Fellow. Haile joined Northwestern University in 2015, after having served 18 years on the faculty at the California Institute of Technology. Sossina Haile's research broadly encompasses solid state ionic materials and devices, with particular focus on energy technologies. She has established a new class of fuel cells based on solid acid electrolytes and demonstrated record power densities for solid oxide fuel cells. Her more recent work on water and carbon dioxide dissociation for solar-fuel generation by thermochemical processes has created new avenues for harnessing sunlight to meet energy demands.

She is the recipient of several awards, including in 2008 an American Competitiveness and Innovation (ACI) Fellowship from the National Science Foundation in recognition of "her timely and transformative research in the energy field and her dedication to inclusive mentoring, education and outreach across many levels," the 2010 Chemical Pioneers Award of the Chemical Heritage Foundation, and the 2012 International Ceramics Prize for the World Academy of Ceramics. In 2016 she was inducted into the African Academy of Sciences.



DR. YACOB
MULUGETTA

Dr. Yacob Mulugetta is a Professor of Energy and Development Policy at the University College London; and held an academic post at the Centre for Environmental Strategy, University of Surrey, UK. He is a founding member of the African Climate Policy Centre (ACPC) at the UN Economic Commission for Africa (UNECA) based in Ethiopia where he worked as Senior Climate & Energy Specialist (2010-2013). He has 25 years of research, teaching and advisory experience specialising on the links between energy infrastructure provision and human welfare. His research is focused on three interconnected areas: energy systems and development; energy systems and climate change; and political economy of low carbon development. He served as a Coordinating Lead Author of the Energy Systems chapter of the Intergovernmental Panel on Climate Change (IPCC) 5th Assessment Report (Working Group III on Mitigation), lead author in the IPCC Special Report on Global Warming of 1.5oC, and currently lead author in the IPCC 6th Assessment Report. Yacob Mulugetta is a Fellow of the African Academy of Sciences (AAS).



ABSTRACTS

Application of smart grid technologies and digitization in power distribution network for increased renewable integration and quality of power supply

Atsede G. Endegnanew, Veritas Consulting and
Merkebu Z. Degefa, SINTEF Energy Research

The energy demand in Ethiopia will grow substantially in 2050 as the population doubles and the economy expands. Meeting this high demand in a sustainable, clean and reliable manner will be a challenge. Moreover, as energy is a cross-cutting issue, solving the energy demand challenge will be essential to solving other 2050 challenges such as manufacturing, ICT, transport, etc.

Concerns over climate change combined with advancement in storage and renewable generation technologies, reduction in prices and increase in efficiency are driving the energy transition from fossil fuels to low-carbon power generation [1]. Ethiopia is endowed with vast amount of solar, wind, hydro, geothermal sources, and the growth in generation will come mainly from renewables. Hydropower will continue to be a major source of electric power generation [2]. However, due to the social and environmental impact of large hydropower projects and, more importantly, due to the negative effect of climate change on water resources, diversification of electricity generation is vital for security of energy supply. Hence, for Ethiopia, 2050 demands the use of other renewables such as solar PV and wind for electricity generation, and also moving towards distributed generation instead of relying on just centralized generation. In addition, the isolated mini-grids that will be built in the next decade as pre-electrification solution for rural Ethiopia will be absorbed by the grid [3] and add to the distributed generation. Thus, the distribution grid in 2050 Ethiopia will have not only power consumers but also distributed generation and will experience challenges such as momentary overloads and periods of reverse power flows.

The expected deployment of distributed generation will require expanding, reinforcing and upgrading the distribution grid for reliable and efficient operation. It will also require energy storage and other 'flexibility' solutions to handle the variable renewable generation. Energy consumers will add value to the grid through demand-side response (DSR) enabled by digital solutions, and close to real-time flexible markets [4]. Integration of smart grid technologies is vital to manage the increasing complexity of the future distribution grids. A smart distribution grid architecture includes power generation sources, control sensors, communication infrastructure, data integration and the different applications running in distribution control centers and in other future stakeholder systems, such as virtual power plant aggregators and energy retailers. Electricity is a fundamental part of the modern life, and households, communities, industries and the economy at large are dependent on it. Today, only 44% of the population in Ethiopia has access to electricity. The government has set a goal of universal access by 2025, entailing additional 14 million new customers within the next 5 years [3]. This requires a huge infrastructure investment in the power generation, transmission system and distribution grid. Furthermore, the existing distribution network is in dire need of refurbishment and upgrade as it has aged and the increase in demand has surpassed its capacity. Thus, the coming decade is crucial for the development of the future distribution grid in Ethiopia. This paper assesses the needs and implications of the 2050 active and digital power distribution grid in Ethiopia. More importantly, the study proposes focal points for policy makers and planners to consider in order to build a future-proof infrastructure with efficient, optimal and cost-effective utilization of resources.

Solving Ethiopia's Energy sector challenges from now to 2050

Solomon Asfaw
LUT University

Ethiopia's current energy demand is dominantly supplied by the least efficient and polluting biomass burning. The remaining portions of the demand that is being supplied by electricity and other modern fuels are also seriously affected due to a challenge that comes because of poor planning and financial shortage. In this talk, we will examine the condition of the existing ener-

gy system challenges and analyze the possibility of addressing these challenges based on the existing energy system plans of the country. The talk will then highlight required measures to effectively address the key challenges, namely lack of resilience, unsustainability, poor electrification and unreliability, of the country's energy sector.

Sustainability - Energy Pile Foundations for Demands of Buildings

Henok Fikre (Dr.-Ing), at Addis Ababa University, Addis Ababa Institute of Technology
Samuel Getiye (MSc-Student) at Addis Ababa University, Addis Ababa Institute of Technology

Over the past two decades, Ethiopia has reported substantial economic growth that made the country among the world's best performing economies with an average annual real growth rate of GDP of 11.8 per cent (2004-2008) and 10 per cent (2009-2017).² This was, however, achieved against the backdrop of a stagnating or slow growing manufacturing sector, large youth unemployment, severe income inequality, natural habitat loss, pervasive human insecurity, restrictive flow of trade and movement of capital and labor; social grievances manifested in the form of street protests; and ethnic and religion motivated killings - unfamiliar happenings in a country with such phenomenal economic growth of more than a decade and half.

This paper argues that Ethiopia has both the potential and means to address the above issues, achieve middle income country status and be among the best performing economies and global players by 2050. Whilst Ethiopia's population currently estimated at 110 million is expected to double by 2050, which when combined with mega constraints like climate change, natural resource degradation and habitat loss, undiversified economy, weak infrastructure and markets, land lockedness and narrow manufacturing base, among others, pose massive challenges, all can be transformed into opportunities for wealth creation and technological transfor-

mation through a development strategy of sound governance, inclusive growth and sustainable development.

The paper, then, offers several strategic actions to be taken, which include: (a) de-ethnicization of Ethiopia's governance architecture and society; changing the political narrative from ethnicism to people centered and driven development (job creation, eradication of poverty and famine, access to quality education and health services, etc.); (b) putting in place internally located processes of structural change and transformation to build a strong manufacturing sector that enables Ethiopia to participate at the high end of the global value chain driven by a strong private sector that operates in concert with a smart and efficient public enterprise sector; (c) expanding the asset boundary of aggregate income through caring for, sustainably using and valuing natural resources, developing capital accounts and pursuing sustainable development; (d) building a development oriented capable state with efficient bureaucracy and ensures human security, equal access to justice and prevalence of rule of law and; (e) putting in place robust development planning (short, medium and long term) well-coordinated vertically (from communities, woreda and provinces to national level) and horizontally (across sectors and social groups) anchored in vigorous M&E and accountability system.



NOTES



FOOD SECURITY

How do we increase agricultural productivity to keep pace with this increase?

How can we achieve food availability, food access and food adequacy?

How do we leverage science, technology and innovation to achieve and maintain food security?

SPEAKER'S PROFILE



DR FETIEN ABAY
ABERA (PHD)

Dr. Fetien Abay Abera is currently the vice president for research and community Engagement, Mekelle University, Ethiopia. She has a Bachelor of Science (1991) from Haramaya University of Agriculture, Ethiopia. She received her master's in Rural Resource Management (RRM) from University of Wales, Bangor, UK in 1996, and a PhD in plant breeding and seed science from the Norwegian University of Life Sciences in 2007. Fetien has worked in institutions of agricultural extension, research and education and is a specialised plant breeder with an educational and professional background that helps her to see her specialisation in a broader context. She has recognised the weaknesses in the conventional processes of technology transfer and has strived – in her own work and in influencing and inspiring the work of others – to change the way these institutions operate and interact.

Dr. Fetien has done an outstanding research as evidenced by the release of six climate resilient, high yielding and quality food and malt barley varieties. She has published several articles and book chapters. As the Integrated Seed Sector Development, Tigray region coordinator (2009-2109), she organised 50 seed producer groups who are currently supplying the major seed requirements for the

Tigray region. She is also known as advocate of women in science. Fetien has received numerous awards and recognitions, but her greatest asset is the support she has provided to women in agriculture to bring awareness about gender equality, an often ignored aspect of role of women in agriculture. In 2009 she is named as one of top 5 African women in Science She also received the "East African Laureates" prestigious prize of the African Union Kwame Nkrumah Prestigious Scientific achievement Award, in 2014. In 2017, Fetien emerged as the second runner-up at the prestigious Impact Research and Science in Africa (IMPRESSA) Awards. The lives and careers of women like Professor Fetien speak to the wealth of under-recognized female talent in Africa's agricultural research sector.



DR. BRHANE
GEBREKIDAN

Plant Breeding, University of Minnesota, (PhD, 1969); Agronomy, University of Nebraska (MSc, 1964); Plant Sciences, Alemaya College of Agriculture, Ethiopia (BSc. 1961).

He has served as Chief of Party of Virginia Tech's Amhara Micro-enterprise development, Agricultural Research, Extension and Watershed management Project (AMAREW) in Bahir Dar, Ethiopia. Prior to that, for 8 years, he was the Program Director of the Integrated Pest Management Collaborative Research Support Program at Virginia Tech. He has also served as Ethiopian sorghum research team leader and breeder, ICRISAT team leader and breeder for sorghum and millet for Eastern and Southern Africa, maize breeder and team leader for Eastern and Southern Africa for CIMMYT. He has served as Department Head of Plant Sciences and taught courses in plant breeding, genetics, biometry, and cropping systems at the former Alemaya College of Agriculture (now Haramaya University). Currently he is an independent consultant.



PROF. TESSEMA
ASTATKIE

Tessema is a Professor of Statistics at the Faculty of Agriculture of Dalhousie University, Canada; and he is a Professional Statistician accredited by the Statistical Society of Canada and the American Statistical Association. Tessema received his Ph.D. in Statistics from Queen's University, Canada. He conducts research in several areas of statistics including regression analysis, and design and analysis of experiments. Tessema collaborated with researchers in 22 countries, including Ethiopia, who specialize in agriculture, human nutrition, and environment that resulted in >160 publications in >75 journals. He has been active in international development projects, including the \$3 M Government of Canada funded project: "Post-Harvest Management to Improve Livelihoods (PHMIL)" that he directed and implemented at Jimma University. The project created the PHM Department and its BSc, MSc & PhD programs. He also received different awards including the 2018 Research Excellence Bikila Award.

Food Security and Agricultural Production

Brhane Gebrekidan (Eth. Acad. of Sci.)

In this presentation, food security refers to the availability of food in sufficient quantity and nutritional quality to all members of a household to enable them to lead healthy and productive lives. In the context of Ethiopia, food security is strongly linked with poverty, hunger, malnutrition, poor physical and cognitive development, and overall low productivity. To tackle these food security challenges and ensure sustainable food security, both at the household and national levels, it is necessary to take aggressive steps to cultivate income growth and overall national economic development. Land fragmentation is recognized as the main culprit restricting the adoption of mechanization in Ethiopia's agriculture. In the case of implements, starting from the oxen-drawn traditional plow all the way to harvesting and storage tools, they are generally inefficient and entail drudgery. The adoption of modern and mechanized tools in farming has a number of prerequisites including availability of large size land, affordability and availability of machines. Without increased use of irrigation in Ethiopia, huge opportunity for crop production is lost annually. Improving water conservation/harvesting and improving water use efficiency / delivery systems are central to solving the food security and production problems of Ethiopia. Large scale irrigation such as those restricted to the main river valleys and dams should be subjects of special attention to the Government of Ethiopia (GoE) and other organized units. Ethiopia's future in adequate and sustainable food security is likely to depend heavily on such areas. The country's livestock development is not efficiently functioning since it is poorly organized and guided, mainly relying on large numbers of holdings than productivity per animal. The basic infrastructures, institutions, policy instruments and regulatory systems essential for the production/marketing of livestock goods and services are very poorly developed, demanding significant improvements.

The food security challenges and the overall agricultural productivity of Ethiopia will benefit significantly if genetically modified organisms

(GMOs) technologies are embraced selectively at the national level.

Engaging and utilizing the national universities as nuclei for regional agricultural development should be encouraged and pursued aggressively. The poor linkage between research and extension nationally still persists which should be rectified soon.

The GoE must take concrete steps to exploit the huge potential of engaging agricultural college graduates in modern and productive agriculture. To this end, the government must address critical policy issues (land availability, bank loans, tax holidays, infrastructure development, irrigation facilities, research and technical support, and facilitating marketing) to cultivate and nurture the establishment and growth of commercial agriculture led by Ethiopian college graduates.

Reasons for yield increase of the green revolution (GR) crops were: appropriate amount of and well timed inputs such as improved seeds, irrigation, fertilizers, pesticides, machinery and overall integrated and judicious crop management. The critical players behind the GR success in India were: political leaders, bureaucrats, scientists and, of course, the farmers. Ethiopia needs a high profile champion to carry the GR banner for the benefit of the country. Ethiopia can benefit significantly in tackling its food security challenges if it emulates and follows the footsteps of India in formulating its own version of GR.

The food security issues which need special policy attention of the GoE are: 1) Engaging agricultural college graduates in commercial agriculture; 2) Institution building for improved food security; 3) Adoption of the Green Revolution strategies using lessons from India; and 4) Focusing on irrigated agriculture. For each of these issues, the revision of the land policy is a critical item which is crying for an urgent and intelligent dialogue, critical government study, and commensurate policy response for the good of the country.

Responding to Reality: The Innovation Factor in Gaining Food Security

Fetien Abay (PhD, Prof in Plant Breeding and Seed), Vice President for Research and community Services, Mekelle University

As a professional of over (years) working in mountainous dryland areas, I believe it would be most helpful for me to attend and benefit from the presentations scheduled during the conference. I am particularly interested in the food security and the keynote address on this theme. The conference theme is especially relevant to my research such as building on local innovation processes and positive exploitation of Genotype x Environment Interactions. Therefore, I appreciate the opportunity given to me to attend this event gathering scholars from various countries. The dry mountainous areas encompass several globally important centres of origin and diversity for crops, vegetables, livestock, trees and fish. Six out of the eight Vavilov's centres of agro-biodiversity for domestication of plants and a number of centres for wild relatives of domesticated animals are found in the dryland mountainous regions. Biodiversity and related local knowledge in those areas are threatened by land degradation and pressure on natural habitats. For such innovations and strategies to be sustainable, they need to find a suitable balance between the use and conservation of often fragile natural resources in mountainous areas. The endorsement of Agenda 21, Chapter 13, entitled "Managing Fragile Ecosystems: Sustainable Mountain Development" at the 1992 United Nations Conference on Environment and Development and the UN's 2030 Agenda for Sustainable Development state that vulnerable people such as small-scale farmers must be empowered.

Nevertheless, in the modern developmental age, mountain peoples have become poorer and have progressively lost control over their subsistence base of resources. According to various authors global ecosystems (including mountains) have deteriorated, genetic resources have been lost/depleted, and the resources upon which human survival depends have dwindled. Because of the Genotype x by Environment interaction (GEI) factors, there are usually no blanket solutions that can be generally applied to all locations, so in-

stead, potential solutions have to be developed that can be carefully adapted by responding to locally specific conditions, in close participation with local people.

The shift of an agricultural system towards market orientation is usually coupled with a shift to intensive cash-crop production, and often as monoculture agriculture. Annual cash crops are cultivated intensively and extensively with the use of hybrid seeds, machines, chemical fertilizers and other farming technologies to increase productivity and production so as to harvest greater profits by marketing products in larger quantities. During the process of deliberate over-production of certain commodities, the market demand is increased in a cyclic way. This higher demand – higher production cycle leads to the replacement of traditional crops that are mainly grown by marginal farmers on poor soils in the rainfed areas and adversely affects their food security for household consumption.

According to FAO (1986), the highlands of Ethiopia include approximately 88 percent of the total population of the country, over 95 percent of its regularly cropped lands, around two-thirds of its livestock, almost half of its land area and over 90 percent of the national economic activity. They are divided into the north-western and south-eastern regions by the Main Ethiopian Rift, which contains a number of salt lakes. The north-western region, which covers the Tigray and Amhara Regions, includes the Semien Mountains. The local indigenous people still farm traditional crop varieties and animal breeds, and maintain a high level of genetic diversity.

Underutilized plant species play a fundamental role in the livelihoods of poor communities living in harsh environments such as mountain areas, although they only have a small share in production and trade. In Ethiopia wild Oat is commonly grown as a weed and sometimes used for local drinks and animal feed. Emmer (*Triticum dicoc-*

Responding to Reality: The Innovation Factor in Gaining Food Security

(Cont'd)

con) and cultivated oats are typical examples of underutilized species suitable for growing in mountain areas, important for food security and cultural value but with a very limited market share. The recent observation of cultivated oats grown by Stayish-Geregera, farmers is an innovative factor due to their response to the climatic/weather conditions of the area. Some restaurants based in tourist areas of Oromia, Tigray, Amhara started to serve/ market "emmer" to tourists in the traditional form of crushed grains for prepared soups. Another example of high agrobiodiversity is the enset (*Ensete ventricosum*) farming system in the highlands of southern Ethiopia, which supports an estimated 15 million people and provides several food and non-food (medicine, aesthetic, religious, fodder, housing) uses. Dekeko (*Pisum Sativum cv abyssinicum*) is grown in the Maychew highlands of the Tigray region. Due its flavour and nutritional content, it is locally called as "fasting chicken" with more than double price of the market value of common pea. Gibto grown in Gojam and known for its health benefits. Despite the recent local initiatives research priority, extension support and marketing of such mountain-based products is limited. There are few initiatives on-farm conservation and value addition and sustainable marketing. Little has been undertaken at policy level that can be translated into support for the development of remote rural areas and the improvement of mountain people's livelihoods.

We have documented various strategies of innovation by farmers in addressing their challenges (Farmer Innovation in Africa). For example, women in mountain regions are active in climate change adaptation and preservation of biodiversity. Some innovative/ pioneer farmers in Tigray have discovered the healthy sauce "hilbet" (fasting sauce product mixed from lentils, faba bean and fenugreek), "tihlo" (fandou type of dish made from barley) at the level of niche market some innovative women started to market it to tourists in its traditional form. Women in Gojam, Hararghe and others develop their local areke (alcoholic

beverage); women in Arbaminch develop "borde". Also in Oromiya, women have developed various innovative products for healthy consumption like chfeka.

Adaptive mechanisms of mountain peoples have to be centred on local ecosystems and resources. Agro-tourism activities can be introduced in responding to the reality by focusing on serving and selling locally produced food products to visitors considerably supported market development. Government policies should respond to the reality so as to introduce suitable support measures like road, transport, communication and mountain development irrigation systems. This will help to increase the competitiveness and sustainability of the mountain economic sector. Marketing indigenous products and their access to agricultural markets can play an important role in rural development, as it integrates rural areas into the urban markets, and creates new trade routes, avenues and commodity chains.

Therefore, mountains merit special consideration in development policy. Under a 'business-as-usual' scenario, without additional efforts such as investments and initiatives to promote pro-poor development, and clear intervention, mountainous people would still be not being able to sell enough to meet their other needs.

Abstract: Food Security and Agricultural Production

Brhane Gebrekidan (Eth. Acad. of Sci.)

In this presentation, food security refers to the availability of food in sufficient quantity and nutritional quality to all members of a household to enable them to lead healthy and productive lives. In the context of Ethiopia, food security is strongly linked with poverty, hunger, malnutrition, poor physical and cognitive development, and overall low productivity. To tackle these food security challenges and ensure sustainable food security, both at the household and national levels, it is necessary to take aggressive steps to cultivate income growth and overall national economic development. Land fragmentation is recognized as the main culprit restricting the adoption of mechanization in Ethiopia's agriculture. In the case of implements, starting from the oxen-drawn traditional plow all the way to harvesting and storage tools, they are generally inefficient and entail drudgery. The adoption of modern and mechanized tools in farming has a number of prerequisites including availability of large size land, affordability and availability of machines. Without increased use of irrigation in Ethiopia, huge opportunity for crop production is lost annually. Improving water conservation/harvesting and improving water use efficiency/delivery systems are central to solving the food security and production problems of Ethiopia. Large scale irrigation such as those restricted to the main river valleys and dams should be subjects of special attention to the Government of Ethiopia (GoE) and other organized units. Ethiopia's future in adequate and sustainable food security is likely to depend heavily on such areas.

The country's livestock development is not efficiently functioning since it is poorly organized and guided, mainly relying on large numbers of holdings than productivity per animal. The basic infrastructures, institutions, policy instruments and regulatory systems essential for the production/marketing of livestock goods and services are very poorly developed, demanding significant improvements.

The food security challenges and the overall agricultural productivity of Ethiopia will benefit significantly if genetically modified organisms

(GMOs) technologies are embraced selectively at the national level.

Engaging and utilizing the national universities as nuclei for regional agricultural development should be encouraged and pursued aggressively. The poor linkage between research and extension nationally still persists which should be rectified soon.

The GoE must take concrete steps to exploit the huge potential of engaging agricultural college graduates in modern and productive agriculture. To this end, the government must address critical policy issues (land availability, bank loans, tax holidays, infrastructure development, irrigation facilities, research and technical support, and facilitating marketing) to cultivate and nurture the establishment and growth of commercial agriculture led by Ethiopian college graduates.

Reasons for yield increase of the green revolution (GR) crops were: appropriate amount of and well timed inputs such as improved seeds, irrigation, fertilizers, pesticides, machinery and overall integrated and judicious crop management. The critical players behind the GR success in India were: political leaders, bureaucrats, scientists and, of course, the farmers. Ethiopia needs a high profile champion to carry the GR banner for the benefit of the country. Ethiopia can benefit significantly in tackling its food security challenges if it emulates and follows the footsteps of India in formulating its own version of GR.

The food security issues which need special policy attention of the GoE are: 1) Engaging agricultural college graduates in commercial agriculture; 2) Institution building for improved food security; 3) Adoption of the Green Revolution strategies using lessons from India; and 4) Focusing on irrigated agriculture. For each of these issues, the revision of the land policy is a critical item which is crying for an urgent and intelligent dialogue, critical government study, and commensurate policy response for the good of the country.



NOTES



ICT INFRASTRUCTURE EXPANSION

How do we increase internet and wireless access/penetration to 70-90%?

How do we build the physical and software infrastructure?

What technologies and innovative approaches can we leverage to attain a strong and reliable infrastructure?

SPEAKER'S PROFILE



MESSAY AMERGA

Messay Amerga is a US engineering executive who has held a number of leadership positions at Qualcomm Inc, Intel Corporation as Vice President and General Manager and is currently at Apple as Senior Director of Engineering with the responsibility of Cellular Modem Technology Development.

Messay is a 20+ year veteran of the wireless industry and has worked on numerous wireless platforms and silicon solutions spanning 3G and 4G and 5G. He started his career at Qualcomm as a modem system designer was more recently the leader of Qualcomm's and Intel's 4G and 5G multimode modem products overseeing roadmap, planning and engineering execution prior to joining Apple. At Apple, Messay oversees cellular modem systems engineering and architecture.

Messay holds more than 40 published patents in the area of wireless modem technology. Messay holds a bachelor degree in Electrical Engineering from Polytechnic University of New York (Brooklyn Poly) and a masters degree in Electrical Engineering from Cornell University.



BERNARD LAURENDEAU

EIT Co-Founder /
Zenysis Regional
Director

Bernard is the Africa Regional Director at Zenysis Technologies, a big data firm helping government officials in low and middle income countries make evidence based decisions.

He is also the co-founder of Ethiopians in Tech, a global movement whose mission is to grow Ethiopia's economy through Tech Innovation and ICT in general. Before joining Zenysis, Bernard was focusing on nearshoring strategies as Vice President of the Location Strategy group at BNP Paribas BOTW. He believes African countries can become IT outsourcing destinations and have the potential to attract major tech investments. To that effect, Bernard organized in November 2019 a silicon valley visit for a high level Ethiopian public/private delegation.

Bernard draws from a decade-long management consulting experience, he holds a MS in mechanical engineering from ENSTA France, a MS in aerospace engineering as well as an MBA from Georgia Tech.



MEKONNEN KASSA

Mekonnen Kassa has earned two degrees from universities in USA; a bachelors degree in Mechanical Engineering and a Masters degree in Information Systems Management. He has been working in Information Technology industry for over 22 years where he led teams to design, implement, and operate enterprise wide systems used by hundredths of thousands of employees and millions of external customers. He is currently leading a Microsoft IT infrastructure service engineering and operating team.



DR. MESFIN
BELACHEW

Dr. Mesfin Belachew has a Ph.D. degree in Computer Science from School of Technology and Computer Science, Tata Institute of Fundamental Research (TIFR), India. His Master's and Bachelor's degree in Computer Technology is from Technische Universität Ilmenau, Germany in 1990. He has a teaching and research experience for more than 15 years as lecturer and senior lecturer in different Universities in Ethiopia. He is an Assistant Professor in Computer Science since January 2004 and worked in this position at Bahir Dar University, Unity University, Addis Ababa University, Adama University and Jimma University. He has also a leadership experience for more than 10 years working at the then Ministry of Communication and Information Technology (MCIT), Ethiopian Agricultural Transformation Agency (ATA), and Orchid Business Group PLC on a different management positions. He served Ethio telecom and Commercial Bank of Ethiopia as member of board of directors.



YODAHE ZEMICHAEL

Yodahe has more than ten years' experience as an automation engineer and then as technical advisor in different roles in government. He holds a Master's degree in Mechatronics. Yodahe has worked for the Ministry of Science and Technology and presently at the Office of the Prime Minister. In his current role, he leads a team of technical advisors working on various technology projects, including the effort in revamping the National ID Program for Ethiopia in collaboration with various government ministries.



YILEKAL ABATE

Yilekal Abate is a Technology and business professional with experience in organization building, development of solutions, risk management tools, software engineering, web technologies, mobile content and services, enterprise solutions, and private sector development. He has diverse experience working in 4 continents. He has previously worked in different capacities at Liberty Mutual in Boston, AIG in NY, Richmond University in London, and Analysis International Ltd. UK. He returned to Ethiopia in 2010 and currently serves on the board of ICTET. He has won academic and other awards, and has a track record of leadership and exemplary performance at work. Yilekal has a bachelor's Degree in Computer Engineering and Mathematics from Richmond, the American International University in London, and an MBA from Massachusetts Institute of Technology (MIT). He has also studied International Baccalaureate at Waterford, United World College of Southern Africa in Swaziland.



**ANTENEH T. GIRMA,
PhD**

Associate Professor,
Computer Science/
CyberSecurity
University of the
District of Columbia

Dr. Anteneh T. Girma received a PhD degree from Howard University in Computer Science /Cyber Security. He has also received his M.Sc. degree in Systems and Computer Science from Howard University, and he received his B.Sc. degree in Mathematics from Addis Ababa University. He has many years of cyber security consultancy and teaching experience and served as the Director of Information Technology at Howard University. Currently, Dr. Anteneh T. Girma is an Associate Professor of Cybersecurity and Computer Science at University of the District of Columbia. His research interests are in Cybersecurity and Information Assurance, Cloud Computing and Security, Digital Forensics, IOT Analytics and Security, Cryptography, and Machine Learning. He is also currently serving as program committee member and technical reviewer of research papers, book chapters, on different Cybersecurity tracks for major journals, international conference and symposiums in CyberSecurity and information technology. Among the awards he had received include the best research paper of the conference award on international information technology conference and recognition award for outstanding research and academic achievement. Recently, he has been honored for an outstanding presentation as an invited speaker at the Soft Computing and Machine Learning (SCML) International Cyber Security Conference held in Wuhan, China, April 29, 2019. Dr. Anteneh Girma has Received research recognition for published cyber security research from a national research organization, science of security virtual organization (SOS-VO), which is the research directorate for NSA. SOS-VO has recognized and selected Dr. Anteneh Girma's published research paper for inclusion in the Science of Security (SOS) index (journal) of significant research in cyber security.



ABSTRACTS

Ethiopia 2050: ICT Infrastructure Grand Challenges and Proposed Solutions

David Nicholson, Chief Technology Officer, Consensus Solutions LLC
Mekonnen Kassa, Global Infrastructure Service Director, Microsoft Corporation

The fourth industrial revolution has been in place for a few decades now. Information technology-based inventions and innovation have been the primary drivers of this revolution. Though a few countries have been leading the innovation, the products and services offered by this revolution have benefited billions of people from many countries around the world.

Ethiopia is one of the beneficiaries, but the benefits realized by Ethiopia are very limited because of some challenges faced in Ethiopia. In this paper, we will briefly summarize the upcoming societal grand challenges Ethiopia will face for the next 30 years, describe specific challenges around Information and Communication Technology (ICT) infrastructure, propose solutions to address infrastructure challenges and discuss

how these solutions to ICT challenges can be leveraged to address Ethiopia's societal grand challenges.

We are delighted at the opportunity to describe information technology infrastructure challenges and propose solutions to help address the identified societal grand challenge. We hope our contributions in this paper will be considered by academics, technocrats, Ethiopian government officials, and private sector leaders to proactively address the upcoming grand challenges that Ethiopia will face over the next 30 years. We welcome feedback and additional input from ICT professionals and the grand challenge sector specific experts.

Public Private Partnership in ICT Sector to improve Ease of Doing Business in Ethiopia

Mesfin Belachew (PhD) Assistant Professor, Addis Ababa, Ethiopia

Public Private Partnerships (PPP) [1] is defined as an arrangement between a public body and a private party or parties for the purpose of designing, financing, building and operating an infrastructure facility that would normally be provided by the public sector. PPP as a model is an efficient formula to implement public services by forming collaboration between private partners and the government. PPP implementation is constituted from a complex legal arrangements designed to share the control, risks and rewards of a set of specific investments among private partners and a government sector.

Ease of Doing Business (DB) [3] is an annually published index report based on empirical research output by the World Bank to measure of an economy's position to the best regulatory practices of a specific country. The report indicates how easy is to set up enterprise in said country by

considering multiple factors like Starting a Business, Getting Electricity, Registering Property, Getting Credit, Paying Taxes, etc. just to list some.

In this paper, we shall address the potential of PPP in improving the Ease of DB in the country specifically in the area of Information Communication Technology (ICT) in Ethiopia. Ethiopia scored 48 out of 100 in the 2020 ease of DB and the overall ranking of the country is 159/190 counties assessed. The position is low and most of the scores are in the area of service delivery at the government offices. Furthermore, some potential area of collaborations in the ICT sector using the PPP model towards improving the ranking of Ease of DB will be introduced.

Cloud Computing Security: A Grand Challenge for the Computing World

Dr. Anteneh Girma

Cloud computing has emerged as an increasingly popular means of delivering IT-enabled business services and a potential technology resource choice for many private and government organizations in today's rapidly changing computing environment. This led to a huge paradigm shift by different organizations moving their information technology services from enterprise-based data centers that run on different dedicated servers on their premises to cloud computing environment. As an emerging and distributed computing environment, cloud

computing also has several security issues associated with its main key features, its primary service, and delivery models. Consequently, as cloud computing technology, functionality and usability expands, unique security vulnerabilities and treats requiring timely attention arise continuously. This research will discuss the main cloud computing attributes, service and delivery models, and address its primary security threats and recommend opportunities to mitigate the risk.

Foresight into the Digital Society of the 2050s in Ethiopia

Dr F. Mekuria, Chief Research Scientist, CSIR, Pretoria

It is clear that to give a foresight of the digital & ICT technologies in play in the year 2050s in a complex society such as Ethiopia is a difficult task. However, using technology trends and an inherently proactive optimistic approach, one can draw the contours of the digital society that can be flourishing in the 2050's in Ethiopia. The foresight paper on the digital society in 2050 is based on the belief that our common digital future can be influenced to go in the right direction, by the good and informed decisions and actions that we take now to shape the impact of digital technologies in the Ethiopian society. It is clear that in predicting the future of emerging ICT and digital technologies, a high level of uncertainty exists, and a range of alternative digital futures can be created.

In the authors opinion the digital society of Ethiopia in the 2050s is predicted to be a society permeated by digital technologies and applications of emerging ICT technologies in all spheres of life. Starting from smart farming technologies using ubiquitous smart sensors, intelligent hybrid electricity grid and high speed smart communication & transportation systems connecting every community to centres of excellence for smart health, smart education, and smart entertainment for indoor and outdoor services. This requires investment in digital

skills development based on a three pronged approach, (starting from now) including: (1) A highly focussed SET educational system geared to produce expertise in creativity & innovative skills to develop digital technologies & services, (2) Digital society skills: Creation of a digitally affluent society aware and capable of using ICT services for its day-to-day lively hood. (3) Expert skills in technical regulation & policy development to guide emerging ICT technologies for socio-economic development, protection of critical infrastructure, data & privacy, promotion of digital inclusion (Leaving no one behind), protection of the environment and promotion of the UN-SDGs. Furthermore, the digital and ICT technologies of the Ethiopia 2050 society, will be designed based on a multi-sectoral socio-scientific design methodology, taking into account the regulatory standards, the legal aspects, cyber-security governance rules, psychological, mental, physical and socio-economic impact on society. Innovations in green technologies, Nano & molecular material technologies, long-life-battery technologies, artificial intelligence and machine learning techniques are important science, algorithmic identity & computing technology areas that will contribute to the formation of the digital society in year 2050 in Ethiopia.



NOTES



LARGE SCALE URBANIZATION

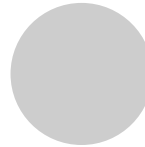
How do large cities like Addis Ababa grow and at the same time address displacement of farmers? What is the role of technology here?

SPEAKER'S PROFILE



BIRKE YAMI

Birke Yami is a practicing professional architect-urban planner and urban development management specialist. She has got MSc in Architecture majoring in urban design and housing from Helsinki University of Technology. She has Certification of Professional Competence from Ethiopian Management Institute. She worked at the Federal Urban Planning Institute and as Lecturer at Addis Ababa University, other government and private organizations. She is currently a senior Architect-Urban Planner and Managing Director of Development Partners Urban Planning and Related Fields Consultancy Firm. She has been engaged as senior expert and coordinator in various projects of Architectural Designs; Regional Development; Transportation; Urban Master, Development and Structure Plans; Local and Neighbourhood Development Plans (LDPs & NDPs), Urban Designs, Norms, Standards and Manuals, Land Inventory, Urban Regulations. She was awarded Certificate of Outstanding Contribution in Urban Planning by the Association of Ethiopian Architects.



DR. MULATU
WUBNEH

Mulatu Wubneh is Emeritus Professor of Planning (East Carolina University, North Carolina), currently teaching at Gondar University (Ethiopia) as Ambassador Distinguished Scholar. Professor Wubneh completed his undergraduate studies at Haile Selassie University (now AA University) and his MS and Ph.D. at Florida State University (USA) in urban and regional planning. Professor Wubneh has served in various capacities at East Carolina University (NC) including as professor of planning, program director and department head. He has published three books and several articles (over 30) in professional journals. In the international arena, he has served as Program Officer at the African Capacity Building Foundation (ACBF) of World Bank coordinating programs in Nigeria, Ghana, Kenya, and Uganda. He has also served as consultant with the World Bank, UNDP, USAID and the Africa Center for Strategic Studies.



BISRAT KIFLE
WOLDEYESSUS

Bisrat Kifle Woldeyessus is an Architect and Planner, who Studied Architecture and Urban Planning (2003 BSc) , and Urban Development (2008 MSc) in Addis Ababa University. He is a lecturer and researcher at EiABC (Addis Ababa University). His research focuses on the co-delivery of housing and services in emerging small towns and cities of Ethiopia.



ROBEL YESHIWAS
ASSEFA

Robel is a young professional working as Urban Planner in Addis Ababa. He holds a BSc in Urban and Regional Planning and MSc Housing and Sustainable Development from EiABC, Addis Ababa University. He is a research assistant and was an assistant Lecturer, formally working in Mekelle University, and He now currently serves as Acting Vice President of the Ethiopian Urban Planners Association. With Ethiopia not giving much emphasis on Urban Planning in most parts of the country, and with the lack of any prominent institutes or sector offices from the government working in Urban Planning, the Ethiopian Urban Planners Association has been in the forefront advocating for a proper urban planning and Robel, for the last one and half years, had been one of the leading the voice of urban planners in Ethiopia, advocating for a policy framework that address the current realities in Ethiopia.



FASIL GIORGHIS

Fasil Giorghis is an associate professor of architecture and chair holder of conservation of urban and architectural heritage at EIABC, Addis Ababa University. He received his bachelor degree from Addis Ababa University in 1985 and his Masters degree from Helsinki University of technology in 1990. For more than three decades, he has devoted his time to the study and preservation of the architectural heritage of Ethiopia. In 2008, he published a book entitled "Addis Ababa the City and its Urban and Architectural Heritage from 1886-1941".

His architectural design work in his private practice focuses on the use of local materials, indigenous knowledge and environmental concerns in contemporary design. In 2009, together with some Swiss and Ethiopian colleagues, they founded the NESTOWN group which works on a visionary idea on development of sustainable rural towns.



GULELAT KEBEDE

Economist by training, Dr Gulelat Kebede has over 25 years of international professional experience in sustainable urban development at local, national and global levels. His most recent experience includes coordinating UN-Habitat's global activities in urban economy and municipal finance and, prior to that, leading the agency's global and regional programmes in training and capacity building. He was visiting scholar at Darmstadt Technical University (Germany), University of Rome, Vietnam National University in Ho Chi Minh City, and the University of Auckland, and fellow of the Stellenbosch Institute of Advanced Studies in South Africa. Currently, he is Adjunct Faculty Member in the Julien Studley Graduate Program in International Affairs within the New School, New York, and guest lecturer at the School of Community and Regional Planning and the Centre for Human Settlements, at the University of British Columbia.



SHIFFERAW TAYE,
PhD, MBA

Shifferaw Taye, PhD, MBA, PPSt & Br, PPCoTeM is an Associate Professor of Engineering Mechanics & Structural Engineering at Addis Ababa University and Adviser at the Ministry of Urban Development & Construction on Capacity Building, Technology Transfer and Policy matters. He is a Fellow of EAS and EACE and a member of ASCE, AISC and IABSE.

He has lectured both in the Country and abroad in areas of structural engineering and construction management both at postgraduate and undergraduate levels.

He established and managed an ISO 9001-certified, Cat II Specialized consulting firm, STRANCOM Engineering, where construction quality and delivery audits had been among the Company's operations in addition to the design of high-rise buildings and other facilities, waterworks structures, latticed towers, light-gauge steel works and railway project civil-works.



BETELEHEM
DEMISSIE

Born and raised in Addis Ababa, I graduated as an architect-planner from the AAU, Building College in 1997, and got my Master's degree in Human Settlements from KU Leuven in Belgium in 2001. My initial engagements as a junior architect-planner with the National Urban Planning Institute (NUPI) for different towns in Ethiopia accrue to a more senior planning expert's role in Addis Ababa's 9th and the recently enacted 10th master plan, assuming different roles upto the Director level for the Spatial Planning department with the Plan Commission up until mid-2019. I am currently engaged with The Urban Center to pursue urban researches. My engagements with UN-Habitat in Somaliland from 2005 to 2008 broadened my insights to the wider region. I have learnt that team work and concerted efforts, holistic and long term perspective, contextual understanding and weighing adequately tradeoffs are key to designing and building better living environments.

The Construction Industry Challenges, Opportunities and the Way Forward

Shifferaw Taye, PhD

Ethiopia has created and adapted the concept of Growth and Transformation Plan, GTP in short, for its multi-faceted development agenda. The Construction Industry is among the economic sectors that play an active role in nourishing the goals and strategic targets of the GTP series and it has shown tremendous growth over the last two or so decades. The Country has also drafted its Construction Industry Development Policy with the view of providing a clearer direction for the development of the Industry and this Policy Document has been in place for nearly six years. This presentation will review the Construction Industry Development Policy in light of its desired contribution for the development, productivity, sustainability, resilience, adaptability and competitiveness of the Industry taking into account the global dynamic nature of the Industry itself. Among the critical elements that dictate the desired holistic transformation of this Industry is the conversion of the Policy document into legal frameworks and to institutionalize its im-

plementation. These are in turn dictated by the quality of Construction Industry Development Master Plan and associated Roadmap – both not known to exist at this moment and thereby leaving the Industry to be lead and managed in a reactive – rather than proactive – manner. The development of these last two concepts is generally influenced by quality and informed leadership and management of the Industry.

Accordingly, this presentation will discuss a fairly reasonable way of establishing Construction Industry Master Plan & Roadmap to help bring about a sound and planned holistic transformation scheme into the Construction Industry. That way, the Country will eventually be in a position to create and craft a policy implementation, monitoring and evaluation strategy and be able to effectively respond to queries such as, quote, "Where do we go from here?".

Sustainable City Development and Government Regulations

Seifu Bekele, Global Wind Technology Services pty Ltd (GWTS), Melbourne, Australia

Hillawi Abreham, Construction Management Team (CMT), Addis Ababa, Ethiopia

Ethiopia is currently an agriculture dominated country, with the sector accounting for 80% of employment nationwide. However, the country is experiencing a rising trend in increased industrialization and urbanization coupled with a growth in its population. Any planning evaluations require to address urbanization, city growth and government roll. As 2050 approaches, a main topic of discussion emerging in Ethiopia is the challenges and opportunities presented by the population growth, and the need for the urban development sector to prepare for the expected

changes such growth will bring.

The challenges of developing sustainable cities by 2050 have been discussed from an environment management aspect. Experiences from other cities, temperature control, the limiting of strong wind, pollution reduction and encouragement of natural ventilation have been discussed and suggestion for regulations and a design guide presented. With the right city plane, well trained professionals and residents' participation, these challenges can be used as an opportunity for growth.

The Hidden Rural Housing Challenges In Ethiopia and an Alternative Mitigation Measure

Kassahun Admassu Abegaz (PhD)

Though the degree of severity is staggering the challenge of housing is evident globally. The dilemma faced by any state operator is how to balance and harmonize the human habitat development and limited resources in equity. Many nations enshrine housing development in their policy with a strategic plan framework; country wide; to keep every citizen on board. In some, such practices do happen rarely. In which case, a certain segment of the population will be left far behind. For such states the wake-up call may be felt very late; by which time, situations might have gone far beyond reversibility by any remedial measure. In Ethiopia, the housing situation in the rural was not given a policy coverage (if not mistaken) until the GTP I and GTP II plans, where it stated that, rural housing is 3,400,000 and the urban including Addis Ababa is 1,500,000 within the period of 2015/16-2020/21; per the 2014 Ministry of Urban Development and Housing Construction (MoUDHC) report. Though not sure of the progress made, time is speeding up. To straighten up the ambitious popular plan, specifically, that for the rural domain, available alternatives have to be critically evaluated. One of such alternatives could be amended compressed

earth block (ACEB). The research postulated as: "amending a given natural soil with lime and powdered pozzolans in the presence of optimal amount of water could be an improvised building material" had achieved a positive result both in compressive strength and durability (water attack) terms; in reference to international earth construction normative. It is thus, juggled as a better performing wall making block and mortar for earthen construction. The lengthy process has gone through the following three profound phases; intensive laboratory synthesis, public outreach pilot project construction, acquire a patent confirming an innovative construction product and publish a paper in a scientific journal of international reputation to herald the success. This article is presented here to introduce the finding that could be a catalyst in alleviating the housing and environmental challenges that Ethiopia is going to face by 2050. The paper covers the progress made so far and provokes with a plan to promote the ACEB construction input at a small scale production level; and thereby, to stand as an environmental steward for the highly coveted flagship of "ETHIOPIA 2050 – Grand Challenges & Opportunities".

Investing in Winners: Spatial targeting for manufacturing growth, formal employment growth and sustainable urban growth in Ethiopia's secondary cities

By Gulelat Kebede and Liz Paterson Gauntner

Ethiopia's ambitious growth and transformation agenda will be well served if the country achieves manufacturing targets and succeeds in making secondary cities hubs of manufacturing growth and employment. However, spatial targeting of manufacturing investments and investments in urban development pose challenges to achieving these goals. There is consensus in the literature that leading, not lagging, cities are the best candidates for successful manufacturing growth (Farole, 2011; Farole & Sharp, 2017; Schroeder, Lall & Schmidt, 2015; UNCTAD, 2019; UNECA, 2018). This paper identifies nine leading secondary cities which pair both manufacturing employment growth with other formal private sector

employment growth. It then examines the state of urban spatial development in those cities and compares forecasted urban growth with urban public investments at the regional level. Rapidly growing cities often face extreme challenges when it comes to planned and sustainable patterns of urban expansion. An analysis of satellite imagery for the nine cities and their surrounding areas over the period of 2011-2018 reveals that, planning has rarely preceded development, but there are marked variations between cities. The review, though not comprehensive in thematic scope and number of cities, provides interesting observations that can inform the strategic discussion on the relationship between sector prior-

Investing in Winners: Spatial targeting for manufacturing growth, formal employment growth and sustainable urban growth in Ethiopia's secondary cities

(Cont'd)

ities and urban development. Ethiopia is perhaps at an early stage of urban differentiation, where some secondary cities are beginning to stand out as best performers in manufacturing and formal sector job creation. The question is whether they are prepared to manage and sustain their economic future through sustainable urban expansion and infrastructure investment. The response depends not simply on what the cities themselves are doing, but on what national and regional governments are prepared to do. The

paper draws out three major recommendations for Ethiopia's secondary cities: First, the national government should target leading cities such as the nine identified, for investments in manufacturing growth. Second, these cities must pair good urban planning and adequately funded implementation with economic investments to ensure the sustainability of growth and urban productivity. And third, it will be important to foster linkages between industrial areas, the labour force and the rest of the economy.

Urban Challenges and Opportunities for Ethiopia 2050

Mulatu Wubneh, Emeritus Professor (East Carolina University, Greenville, NC) Ambassador Distinguished Scholar Program (ADSP (Gondar University))

Ethiopia 2050 is expected to focus on the major challenges and opportunities for development in Ethiopia. The purpose of this brief paper is to identify some of the urban challenges facing Ethiopian cities and to propose strategic measures that can help address the problems. The study will proceed by first identifying the major challenges and then follow by listing the strategic actions. Because of space constraint, the discussion will be limited to a few major challenges that urban areas in Ethiopia face.

Challenges and strategic measures

1. High rate of urbanization – Institute an urban policy that will direct the urbanization trend by encouraging the growth of some of the regional towns such as Adama, Bahir Dar, Dire Dawa, ... about 15 to 20 major regional cities. Redirect migration to these towns by providing job, educational and other opportunities.

2. Urbanization and the development trap – The Ethiopian economy is shifting from agricultural to service-based industries, which is of lower productivity. On the other hand, Ethiopia has rich agricultural resources, and the global demand for agricultural products is increasing. The country needs to modernize its agricultural sector concentrating on agro-processing industries

such as packaged coffee and tea, canned food products, edible oil, textile, leather and leather products for exports to European and Middle Eastern Markets. It should also deal with major barriers constraining the expansion of the economy.

3. The 'irrational' land holding system – Ethiopia's land holding policy is a burden to the national economy, irrespective of the political rhetoric and ideology that maintain that the policy is protecting poor farmers. Several studies have documented that the current land holding system is riddled with a host of problems. Most of all, it is a policy that dampens the investment spirit of the private sector. The country has to push for private property with all its responsibilities and obligations including the right to exclude others, even the government, except in the case of eminent domain.

4. The Institutional bottlenecks - The lack of a strong legislation that clearly defines the powers and responsibilities of municipalities vis-à-vis the states (killils) and the Federal Government is one of the major bottlenecks in the development of urban areas in Ethiopia. There are problems among neighboring communities in terms of running one's affair and sharing and controlling resources. For instance, there is a host of issues

and problems affecting the status of Addis Ababa – What is the role of Addis Ababa as a Federal capital? Who should have a say about Addis Ababa's fate? Should Addis Ababa be allowed to grow? Who has the power to annex territories in the surrounding areas? The paper will try to share some ideas based on the experiences of other countries.

5. City planning or master planning as a 'dirty' word – The term is viewed as a 'dirty' word in the Ethiopian urban lexicon because of politics in the last few years. What is a master plan? What is its role in the development of any municipality? Why is a master plan necessary? The paper will try to give a general explanation of the concept and why it is useful in the development of any city.

6. City Financing - Many municipalities do not have the capacity to expand their local source of revenue yet the demand for expansion of city services is increasing at an unprecedented rate. How can a city expand its sources of revenue? What is the experience of other countries in expanding their sources of financing?

7. Housing – Providing housing is one of the major service responsibilities of any municipal government. Yet, millions in Ethiopian cities cannot afford to have a 'decent' home. How can municipalities make housing available to its residents? Some experiences that will help to initiate housing programs will be shared.

Urbanization, Poverty and Housing in Ethiopia

Tegegne Gebre-Egziabher, Professor

Urbanization is a major socio-economic transformation that entails a shift of population from rural to urban center and a far reaching economic and social change with accompanying infrastructure and service development. These shifts and changes, however, are not smooth and rather require financial, technical, planning etc capabilities to meet the pressures arising from urban development. Similarly, the processes of urbanization, its pace, pattern and direction need to be understood if urbanization is to yield positive results.

Urbanization processes are country specific and the sets of challenges are also unique to different countries. As a result, there is a need to assess the unique challenges of and suggest ways forward in order to help urbanization fosters economic growth, brings social transformation and contributes to poverty reduction.

At 20 per cent urbanization level in 2017, Ethiopia

remains one of the least urbanized countries in the world. The country however is experiencing a fast rate of urban growth as manifested in the tripling of its urban population from 4.7 million (1984) to 11.7 million (2007), a 150 percent increase (Tegegne and Edlam, 2019). The absolute size of the urban population has reached 19.1 million in 2017 and it is expected to more than double over the next twenty years and reach 42.4 million in 2037.

Urbanization in Ethiopia faces several challenges that hamper the rural-urban transition. These challenges have to be surmounted if urbanization is to be promoted and the country is to reap its benefits.

Two of the major challenges of urbanization in Ethiopia are increasing poverty and housing deficits. The two are interrelated as social inequalities and poverty are closely associated with housing deprivation.

Urbanization, Poverty and Housing in Ethiopia

(Cont'd)

Housing is one of the fundamental human needs required for healthy living. It is a means of ensuring human dignity and is essential for health, privacy and personal space, security and protection. As a result, housing deprivation leads to deprivation of the basic condition of well-beingness and productivity (Wondimu, 2006). The Sustainable Development Goals call upon member countries to "ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums [by 2030]". According to the estimate of the UN-Habitat, at least 2 billion more people will require housing in urban and rural areas in 2030 both due to population increase and existing housing deficits (Un Habitat, 2016). The UN also estimated that over 100 million homeless people and over 1 billion people worldwide are inadequately housed.

Inadequacy of housing is more pronounced in urban areas than in rural areas. This is due to the rapid growth of urban population which is beyond the capacities of urban centers to accommodate the housing demand. Though it is clear that urbanization if managed successfully, can lead to higher productivity, earnings, social services and a better quality of life, it can also lead to huge challenges and can result in the proliferation of slums, informal settlements, inadequate housing and extreme poverty, homelessness, unemployment etc if managed poorly.

The housing situation in Ethiopia is characterized by deplorable quality, overcrowding, extreme shortage and proliferation of informal houses. Poverty is also on the rise especially in urban Ethiopia. The rapid pace of urbanization mainly fueled by rural urban migration is transferring poverty from rural to urban areas (Tegegne, 2011). Urban poverty thus concentrates in the cities and this is exacerbated by weak capacity of local governments to cope with the increasing poverty. Urban poverty in Ethiopia is reflected in the forms of beggary and prostitution, growing number of homeless and street children and increasing trends in youth and adult unemployment (Mehert, 2002).

This paper examines the effects of urbanization on poverty, affordable housing and homelessness in Ethiopia. It also examines some of the interventions along these areas in order to ease the situation and suggests ways forward.

The paper has six sections. Following the introduction section, the second part examines the processes of urbanization, patterns and trends. Section three discusses housing supply characteristics and the available evidence on urban poverty in Ethiopia. The fourth section discusses the effects of urbanization on affordable housing and poverty by raising different issues related to land supply, housing needs and demand and characteristics of urban poverty. Section five reviews the present intervention areas to overcome lack of affordable housing and homelessness and urban poverty. The Integrated Housing Development Program (IHDP), the urban safety net programs and the Micro and Small enterprises interventions will be assessed as policy measures designed to address the issues. The conclusion will put some suggestions as ways forward.



NOTES



STEM EDUCATION

How do we scale-up access to higher education and find employment to the tens of graduating young men and women?

How do ensure the quality and type of education will enable the next generation better equipped to succeed?

SPEAKER'S PROFILE



AREGA YIRDAW, PhD

Areaga Yirdaw (PhD) is currently the Chief Executive Officer (CEO) of MIDROC Technology Group and President of Unity University. In his capacity as the CEO, he carries executive leadership and management responsibilities of 26 Technology Group Companies. The Companies are engaged in multi-sector business activities including mining, agriculture, real estate, retailing, air transport, engineering, education, project management, manufacturing and distributions. He has served as General Manager/CEO of MIDROC Gold Mine PLC, the largest mine in the country for 20 years. He also serves as the President of Unity University, which is the first and largest private higher education institute in the country. He came to his current executive leadership of MIDROC Technology Group after 20 years of professional services in the USA, where he was engaged in Engineering, science and management activities in technology based companies which are involved in the design and manufacturing of components & systems for use by commercial & military aircraft as well as missiles. He is among the recognized leaders in the Aerospace, Defense and Air Transport Engineering services. His contribution in the design & manufacturing of the MD-80 automatic brake valves and the flight control systems for the known Maverick and JDAM missiles are among the notable achievements scored. Prior to the above assignment, he served Ethiopian Airlines for 10 years in the Engineering, Quality Control and Corporate Planning Departments. He has also served

as a responsible resident Engineer at Boeing, Washington State, during the manufacture and delivery of the first Ethiopian Airline Boeing 727 Aircraft. Dr. Arega Yirdaw holds BSc (in Mechanical Engineering), MSC (in Air Transport) and PhD (in Corporate Management) and EdD in Educational Leadership and Change, from Universities in Ethiopia, United Kingdom and United States of America respectively. Dr. Arega Yirdaw holds several awards and professional licenses in recognition of his professional achievements. He has authored & co-authored several professional publications and is a member of many professional associations.



DR. WUBALEM FEKADE

Wubalem (B.Sc. Ag Econ, M.Sc. Dev. Plan; Ph.D., Spatial Planning) heads the Social Development and Communication Unit at the Eastern Nile Technical Regional Office, Nile Basin Initiative (NBI), Addis Ababa. He initially joined the NBI as Lead Specialist for the Confidence Building and Stakeholder Involvement Project of the Shared Vision Program. Prior to this Dr. Wubalem researched, taught, consulted and worked in several African countries (including Ethiopia, Tanzania, Kenya, Uganda, Sudan, Gambia, Ghana, Lesotho); in Europe in the field of spatial/development planning and management and in the United States as independent consultant in several disciplines including conflict management (Project Coordinator, CIDCM, University of Maryland, College Park).



REBECCA HAILE

Rebecca Haile is the Executive Director of Ethiopia Education Initiatives, a not-for-profit organization she co-founded to bring quality education opportunities to talented Ethiopian students. EEI's first project is the Haile-Manas Academy, a premier co-ed secondary boarding school for 400 students, located in Debre Birhan.

Rebecca is a graduate of Harvard Law School and of Williams College. She clerked for the US Ninth Circuit Court of Appeals and has worked at top law firms in Washington, DC and New York City. Most recently, she was Executive Vice President of Finance and Operations at Foros, an independent strategic and M&A advisory boutique firm she helped establish in 2009.

Rebecca has authored *Held at a Distance: My Rediscovery of Ethiopia*, a memoir about her return to Ethiopia after her family's forced exile following the 1974 revolution and twenty-five years in the United States. She serves as a Board Member of The Brearley School, an independent K-12 girls' school in New York City, and of Emily's List, an organization that works to elect women to political office in the US.



DR. ABEBE KEBEDE

Abebe Kebede is Associate Professor of Physics at North Carolina Agricultural and Technical State University, USA. He is the editor-in-chief of three journals, *Scientific Ethiopian*, *Ethiopian Journal of Physics (EJP)* and the *African Journal of Physics (AJP)*. He is the founder and coordinator of several scientific and academic based groups including, the *Ethiopian Scientific and Academic Network(ESAN)*. He is currently the international Liaison for *Educators Without Borders*. His recent work includes time distributed ESAN

conferences, schools, seminars and workshops in Ethiopia. Abebe is part of the international movement to equip schools in Ethiopia with STEM and library resources. In collaboration with several interest groups and Books for Africa, Abebe is leading the distribution of computers and several thousand volumes of books to schools and universities in Ethiopia



TESFAYE TESHOME FENTABIL

Tesfaye Teshome Fentabil, PhD, MBA, is an Associate Professor of Forest Management and Deputy President, Research, Publication, Communication, University-Industry Linkage at Unity University, Addis Ababa, Ethiopia.

He obtained his doctoral degree from Aberdeen University, Scotland, UK (1996), MSC in Technical University of Dresden, Germany and Diploma from Wondo Genet College of Forestry, Wondo Genet, Ethiopia.

His experience covers engaging as Dean Wondo Genet College of Forestry and the then Faculty of Forestry at Haramya University, Vice President for Academic Affairs and Research at the then Debu University now Hawassa University and Director General, Higher Education Relevance and Quality Agency(HERQA).

He has published several journal articles, book chapter and conference proceedings in varieties of forestry and education topics. Journals include *Forest Ecology and Management*, Elsevier; *Southern African Forestry Journal*, SINET; *Ethiop. J. Sci.*



TESHOME ABEBE

Dr. Teshome is currently a Professor of Economics and Professor Laureate at Eastern Illinois University where he is also serving on the faculty senate. His prior extensive experiences include serving in various academic administrative roles beginning in 1981 and extending into 2001. During that period, he served as Department Chair, Dean, and later as Associate Vice President for Academic and Student Affairs at Colorado State University in Pueblo, Co.; Provost and Vice President for Academic Affairs at FSU in Michigan; and Provost and Vice President for Academic Affairs at Eastern Illinois University. Dr. Teshome has co-published three books, a number of articles, and numerous essays; the latter, concerning Ethiopia and Ethiopian affairs.

He is interested in STEM education and co-organizes a network of Ethiopian STEM professionals in North America. In this role he participates in formulating strategic plans and teaches graduate instruction. With Prof. Muluneh Yitayew of The University of Arizona they maintain an online course platform aimed at science and engineering students from Ethiopia.



TEMESGEN MARKOS
KINDO

Temesgen Markos Kindo is an engineer interested in the use of mathematical modeling and computer simulation in science and engineering. He received a PhD in civil engineering from Duke University for research in computational contact mechanics.

Temesgen is currently a modeling & simulation Engineer at Amgen Inc. He develops computational models to address challenging problems in drug delivery devices. Previously he was an applications engineer at COMSOL Inc specializing in structural mechanics and equation-based modeling. Before moving to the USA he studied and worked in the Netherlands (Eindhoven) and Ethiopia (Arbaminch).



SISAY ASEFA, PhD

SISAY ASEFA is professor of Economics at Western Michigan University (WMU). Prior to coming to WMU, he taught at Iowa State University, where he received his MSc. in Agricultural Economics and Ph.D. in Economics in 1980. He is the founding director of Center for African Development and Policy Research (CADPR) and Chief Editor of International Journal of African Development at WMU. He has published a number of journal articles, edited books, authored chapters in books & proceedings.

He is the editor and co-editor of the following six books: *Economic Decision Making: Public and Private Decisions* (1985), *World Food and Agriculture: Economic Issues and Problems* (1988), *Human Capital and Economic Development* (1994), & *Economics of Sustainable Development* (2005), *Globalization and International Development* (2010) and a *Political Economy of Good Governance* (2019). He served as editor of four volumes of Social Science journals published by Michigan State University Press: He was born in Ethiopia and attended Addis Ababa University in 1969-71 and graduated with a BA in Economics and completed his Ms and PhD at Iowa State University. His publications have appeared in major refereed journals in international development such as *Economic Development and Cultural Change* (1997), *World Development* (1999), *Studies in Comparative and International Development* (1991), *Northeast African Studies*, *Eastern African Social Science Review* (2002), *African Finance Journal* (2003), *International Journal of Ethiopian Studies* (2003), *Journal of Global Awareness* (2003), *Horn of Africa Journal*, and *Eastern Economic Journal*. He teaches courses in African economies, Development Economics, Microeconomics and

Managerial Economics. His research interest and expertise in the area of political Economy of Poverty, food security, rural Development, and relationships between governance and sustainable development in developing countries in general and Africa in particular. Sisay has been a visiting scholar to Michigan State University, the University of Wisconsin-Madison, the University of Botswana, University of Pretoria, Oxford University, Addis Ababa University, and Adama Science and Technology University, Ethiopia. He is recipient of three Fulbright Fellowships of various lengths. He was Fulbright Scholar to Botswana, 1987-88, Fulbright Visiting Professor to Addis Ababa University and the University of Pretoria in 2002, and he was Senior Fulbright Visiting Professor for six weeks in 2005 at Addis Ababa University Institute of Development Studies and to Adama Science and Technology university 2009, where convened 5th International Conference on Sustainable Development in collaboration with ASTU. He was inducted as honorary member of Alpha Kappa Mu (AKM), a US academic honor society in 2001, and listed in the *Global Who is who in Economics* in 2000. He is past and present member of professional associations such as the American Economic Association, American Agricultural Economics Association, Ethiopian Economic Association, Ethiopian Agricultural Economics Society and Founding Member of Ethiopian American Foundation and founding president of Ethiopian Development Institute. He is a member of external advisory panel of MSU Department of Agricultural Economics. At WMU, he has served as a member various departmental and university committees, including an elected senator at-large member of the WMU Faculty Senate. He has three children all University of

Michigan graduates all professionally employed. He received three top awards for academic and service excellence at WMU. He received the College of Arts and Sciences Achievement Award in 2007, the University Distinguished Service Award in 2008, and the first Excellence in Diversity Award for Faculty in 2011. Most recently he received Career Achievement Award in Global Engagement from Haenicke Institute of Global Education at WMU. Professor Sisay has taught short PhD course on Rural Transformation Policy, Agricultural Systems and food Security at the Institute of Development Studies and School of Economics, Regulatory Economics and Institutions at AAU, and PhD courses in Development Economics and Microeconomics at the International Leadership Institute (ILI). Recently, he convened 10 successful biannual international conference entitled "Challenges and Opportunities for Sustainable Development in Africa on August 2018. He plans to retire on August 10, 2020 after 40 years of academic service wondering where the years have gone ?, as Emeritus Professor of Economics with plan to engage the African Development Research center at WMU in continued publishing of e-journal on African Development that began in 2013 and continue as public scholar on critical issues of global economy including justice and leadership critical for 21 century as well as organizing biannual conferences both in Michigan and Ethiopia. He is proud of his family that includes three children two sons Samuel and Ben both professional Engineers and a daughter Aden a public health Professional working FDA, all three graduates of University of Michigan, Ann Arbor and his wife Mimi a local real estate agent at Jacque Realtors in Kalamazoo .



PROF. MAMMO
MUCHIE

Prof Mammo Muchie founded the African Journal on Science, Technology, Innovation and Development (AJSTID) in 2008 and serves as its editor-in-chief. He has been given a number of awards: long dedicated and valued service awards, best institutional senior researcher of the year merit, academic excellence award, outstanding contribution to Science, Engineering, Technology (SET) and innovation by NTSF in South Africa. Professor Muchie's scholarly contribution to the discipline of innovation has been: strengthening and contextualising the theoretical framework of National Innovation Systems as applied to the African context. The principles and theory of the National Innovation Systems, as it is practised in the developed and industrial economies could not be applied directly to the developing or under-developed and largely agrarian economies of the African continent. Prof. Muchie took up the mammoth task of producing an impressive body of research on the innovation systems (in whatever rudimentary forms or degrees of evolutionary state they exist) in various African countries. He taught over 400 doctoral candidates in doctoral academies across the world in the Globelics, Africalics, Cicalics, Indialics networks. He has taken major initiatives for running Doctoral and Masters Academy in various universities in



PROFESSOR
MESKEREM TADESSE

Professor Meskerem Tadesse is a tenured faculty member in the Business Administration Dept. at the University of the West, where she also serves as Director of the Center of Small and Minority Business. She is the Founder and CEO of the Optimize Group, Inc., a CA-based strategic and financial management consulting firm which she founded in 2003.

Professor Meskerem is a former Fortune 500 corporate executive (Bayer-USA and Chrysler Corp.) with broadly diversified expertise in strategic and financial management, international business/finance, treasury operations, M&A and ForEx management. Her global experience includes direct responsibilities for a major divestiture in India, and various assignments involving Canada, Europe, Asia, Latin America and the US. She has extensive experience working with the investment banking community with a strong track record for her tenacity and skills to effectively structure and negotiate complex financial transactions, earning her the nickname "Margaret Thatcher" by her British investment bankers. Prof. Meskerem is also dedicated to her community, serving as board director for several business and non-profit organizations. She is also a member of several professional organizations and chambers. Her professional and academic writings include diverse topics, such as "Debt Restructuring & Creative Financing", "Impact of Cultural Differences on International M&As", "Navigating through the Financial Crisis", and her proprietary "Optimize-U Entrepreneurship Management" workshop series.

She is a recipient of several awards and recognitions including the 2015 Distinguished Leadership Award from the California Regional Black Chamber of Commerce, and the Most Outstanding Faculty Award

from Univ. of the West, both by the faculty (2013) and by the Student Government (2017). She has appeared on various media including radio, TV, newspapers and business magazines.

Professor Meskerem is currently on sabbatical leave in Ethiopia, teaching international business at St. Mary's University in Addis Ababa, working with government and private business leaders and mentoring young Ethiopians on Financial Literacy and Dream Optimization, which she passionately champions as key drivers of economic empowerment and wealth-building consciousness.



DR. GHEBREBRHAN
OGUBAZGHI

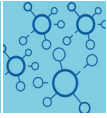
Dr. Ghebrebrhan Ogubazghi is professor of geophysics at the Department of Earth Sciences of the Eritrea Institute of Technology (EIT) at Mai Nefhi (close to Asmara). He received the BSc degree in electrical/electronic engineering, MSc in signal processing, and the PhD in geophysics, respectively, from the universities of Addis Ababa, Nice (France), and Toulon (France). He was with the Geophysical Observatory of the Addis Ababa University from 1977-92; with the University of Asmara from 1992-2003; and with the EIT from 2003-present. His research work includes optimizing the signal processing system of the new generation of clear air atmospheric radar systems (also called wind profilers) and has obtained research fellowships from: The International Centre of Theoretical Physics in Trieste (Italy) 1991-98; the universities of Toulon 1988-2000, Kyoto (Japan) 2001, and Meijo (Japan) 2016-17. Among his research contributions in this field is the technique of full decoding of truncated ranges which enhances the performance of these systems, particularly in equatorial regions. He is also involved in seismology and seismic hazard assessment, and has made research stay at the university of Bergen (2001-2002), attended a number of workshops, and conducted collaborative research with colleagues of the Eastern and southern Africa Regional Seismological Working Group and with a number of overseas universities. Among other things, these efforts produced in 2017 the latest seismic hazard assessment for Eritrea and its surroundings. He has held academic leadership positions at the University of Asmara: Director of the Institute of Research and Development (1992-94), Dean of the College of Science (1994-2000), Director of research and Coordinator of graduate Studies (2002-03); and at the EIT: Academic Vice President of the EIT (2003-12), and Head of the Geophysics Research Laboratory

(2003-present). During 2015-17, he led a team of researchers to implement a government sponsored Research Project for the assessment of natural and human induced hazards in the northern and southern Red Sea administrative zones of Eritrea, and considering geo-hazards, agro-climatic and environmental hazards, and marine hazards, they came up with an assessment of hazards and proposals of community-based disaster risk mitigation and management measures for the two administrative zones.



MAHLET MESFIN

Mahlet Mesfin is a visiting scholar at the Penn Biden Center for Diplomacy and Global Engagement. Most recently, she was the director of the Center for Science Diplomacy at the American Association for the Advancement of Science (AAAS). From 2014-2017, Mesfin served in the White House Office of Science and Technology Policy (OSTP), most recently as the Assistant Director for International Science and Technology (S&T). There, she led and advised on the strategic planning, coordination, and execution of the S&T-focused engagements under the responsibility of the U.S. President's Science Advisor, and championed S&T as an element of the broader U.S. government's foreign policy agenda. Previously, Mesfin was a AAAS S&T Policy Fellow at the U.S. Department of Defense, where she worked on projects related to the DoD's basic research ecosystem and the Department's international S&T engagement. She has also been a policy fellow at the U.S. National Academy of Sciences and Engineering. She received a Ph.D. in bioengineering from the University of Pennsylvania and a M.S.E. in biomedical engineering and B.S.E. in chemical engineering from the University of Michigan, and she is a term member of the Council on Foreign Relations.



ABSTRACTS

Relevance of Higher Education to the Development of Ethiopian Society

Tesfaye Teshome

Although Ethiopia has invested in higher education over several decades and has many graduates both from its own universities and other institutions abroad, their contributions to changing the agrarian economy of the nation to a more versatile modern economy are insignificant. To change this scenario, the current developments in the higher education system have to acknowledge changes to address major challenges facing the country. This study justifies why higher education relevance is an issue now and the years to come more specifically up till 2050 in Ethiopia. The new context of relevance

and its implication on higher education, the issue of quality enhancement, and the need of introducing competence-based curriculum are also conversed. The other relevant issues that are dealt with are research undertaking, community services, use of ICT and cost efficiency. The paper also suggests recommendations on how to make the education, research and community services relevant to the socio-economic development of the society.

Enhancing meteorological and climatological services and research through regional cooperation: The case of the Horn of Africa and neighboring countries

Ghebrebrhan Ogubazghi

Mai Nefhi College of Science

Eritrea Institute of Technology

Most of the population of the Horn of Africa and neighboring countries are engaged in rainfed agriculture and pastoralism, and they are highly vulnerable to the consequences of climate change. In Ethiopia, for example, agriculture employs about 80% of the inhabitants producing 54% of GDP and 90% of the exports of the country. The per capita productivity of this segment of the population is low compared with those in the other sectors. It is proposed that good meteorological and climatological services (M&CS) could significantly improve the livelihoods of this population. These services are also vital for the aviation industry, with Ethiopia having the best airline in Africa, along with Kenya which also has a good airline (given the rugged landscape, and the prevailing poor road network of most of the countries of the region, air transport is likely going to increase significantly in the future). Further, M&CS directly or indirectly impact most of the 10 themes of the

Conference, and new developments in science and technology during the last 40 years have made seasonal predictions feasible and have boosted the importance of M&CS. As natural phenomena do not know political boundaries, M&CS are best done through regional and international cooperation, and to optimize performance and to ensure continuity and sustainability the effort must be supported by good research component. The base has been put in the region in the form of national agencies and the IGAD Climate Prediction and Application Centre (ICPAC). The paper gives some details of modern data collection and processing systems and points out the importance of communication between the researchers, operational agencies, and end users. It emphasizes the necessity of ensuring that forecasts reach end users in good time, and that agrarian reforms be accelerated to enhance the options available to end users to maximize effectiveness.

Can a flipped Class Save Ethiopian Higher Education?

Dr. Temesgen Markos Kindo

A flipped classroom, sometimes called an inverted classroom, is an educational strategy that reverses the traditional relationship between instruction and student led activities such as homework. In a flipped classroom students go through curated instructional material on their own, often online, and come to class to work on homework or projects. The instructor becomes more of a resource person.

The flipped classroom has been used from school education to college education in many countries and the results are mixed. In this talk we want to investigate the utility of a flipped classroom to alleviate instructor shortages in Ethiopian universities. Many lower level and sometimes senior science and engineering classes in Ethiopian universities are currently taught by graduate assistants, to the detriment of the quality of education. Our hypothesis is a flipped classroom will make available at low cost high quality ed-

ucational material curated by experienced lecturers and industry professionals. The graduate assistants can then serve as moderators for recitations, homework, projects etc. In this talk we hope to generate discussion on the possibility of repurposing what was originally conceived as a high-end product as a remedial strategy in the context of undergraduate science and engineering education in Ethiopia.

We will present data from a variety of contexts in which flipped classrooms have been used, the pros and cons, a proposal on how to implement it in Ethiopia, a strategy for involving the diaspora scientific community, identify possible challenges and opportunities in the Ethiopian contexts, and finally seek collaborators from Ethiopia universities.

Labour Market Information (LMI) for graduating skilled STEM manpower to accelerate economic transformation of Africa

Tessema Astatkie

Professor of Statistics; Faculty of Agriculture,
Dalhousie University, Truro, Nova Scotia, Canada

Labour Market Information (LMI) plays a key role in developing and revising tertiary STEM education programs to meet the needs of highly qualified graduates to accelerate the economic development of any country. LMI is needed at all tertiary educational institutions including universities, colleges, technical training institutes, and community colleges to get information on labour market trends, skill requirements of the economy, and technological changes and how they affect skills development. Governments need LMI to identify policies and design programs that will encourage human resource development and support employment growth over the long term. The private sector also needs LMI to identify via-

ble areas of investment and expansion that have skilled manpower, and to identify the types of jobs that can be or should be done by machines and robots. For a given sector, LMI would identify the education, job and skill sets/levels requirements for the sector in the country and neighbouring countries where graduates are likely to be employed; the employment demand (current and projected) for workers in these occupations; the Long-range employment prospects in the country; the current wages and salaries by occupation in the country; the Information on potential employers and how to contact them; and the overall economic outlook for the sector. This information is collected by conducting a survey of

appropriate stakeholders using the International Standard Industrial Classification (ISIC) to make the programs and skill sets transferable across countries. This presentation reviews applications of LMI in tertiary educational institutions, governments and the private sector, and Labour challenges of the future: Automation.

Grand Challenges and Opportunities

Wubalem Fekade, Ph.D.

The proposed International Conference under the above theme has identified 10 critical sectoral priority areas that will pose formidable challenges to Ethiopia for the next three decades, and beyond. These pertain to: water, food and energy security; urbanization; manufacturing, transport and (physical) infrastructure; IT infrastructure; health care and education (STEM).

Addressing the above major development challenges assumes the following: (a) that there will be strong political will and commitment, on the part of national and subnational leaders, to put in place policies that prioritize the identified challenges; (b) that concomitantly there will be a bureaucracy (civil service/public administration system) staffed by technically competent, ethically clean, administratively accountable and responsible professionals competitively recruited on the basis of merit, remunerated and incentivized reasonably; and that this highly competent and professionalized bureaucracy will translate policies into actionable plans and programs, follow thru their implementation; (c) that overall there will be in the country societal value, political and civic culture that abhors and fights corruption – corruption that has gotten massive, organized and has become a structural impediment to the material and spiritual progress of the country. Would these conditions obtain in Ethi-

opia in the next three decades when and if we embark on meeting these challenges?

I posit that planning and implementing development interventions on the assumption that political will of leaders is a given (which in itself is a very ambitious assumption!) while paying scant attention to the inadequacies of government structures, competencies and capabilities to translate political goals (read policies) into actionable plans and programs will render these good intentions to remain only as mere wishes, resulting in investment project carcasses (half-completed “sugar estates”, factories, irrigation schemes, railways) that have absorbed billions of dollars as sunk costs, wasting the little the country has.

Properly appraising the planning and execution capacities (or lack thereof) of the bureaucracy must be part and parcel of the entire planning and discourse process. This is a major constraint. There are countries that have been in similar predicaments and yet have gotten over this constraint and realized significant political, social and economic progress in reasonably short time. We can and should learn from them. I will share these experiences during my presentation.

Mahlet N. Mesfin, PhD
Visiting Scholar; Penn Biden Center for Diplomacy and
Global Engagement

Science, technology, and innovation (ST&I) have long been considered the engines of discovery and economic growth. In recent years, there has been increased emphasis on the role that ST&I plays in other areas of society such as development, sustainability, and diplomacy. In particular, much global attention and momentum has been building around the ways in which ST&I can and should be utilized and leveraged to articulate, advance, and achieve the UN Sustainable Development Goals (SDGs) , a list of 17 goals that were unanimously accepted by the international community in 2015 as part of the 2030 Agenda .

The SDGs align well with the topics and focus areas of the Ethiopia 2050 Conference such as urbanization, food security, energy, and health care. In addition, the SDG provide a useful framework to demonstrate the inter- and transdisciplinary nature of the challenges that nations and the global community need to address in order to achieve success in the goals in any one area. The need to cross boundaries between scientific and technical disciplines, various stakeholders who

must be engaged (e.g., scientists, engineers, policymakers, the public) and different generations is a critical part of driving forward the solutions to the challenges that Ethiopia and the rest of the world face now and in the future.

Ethiopia's fast growing economy, vast technical expertise in-country and among the diaspora, and broad support for ST&I within the government makes it well-positioned to drive action towards putting ST&I at the center of maximizing the opportunities and solving its current and future challenges as outlined in this meeting's agenda. This talk will discuss some trends and considerations for maximizing the potential for success of efforts from within the scientific and engineering community such as leveraging the UN ST&I for SDG process, strengthening the science policy interface, advancing research at the nexus of disciplines and around grand challenges, and training and empowering the next generation of scientists and engineers.



NOTES



SUSTAINABILITY AND ENVIRONMENT

How do we address pollution and climate change pressures on the Rift Valley Lakes, Lake Tana, and the major rivers?

SPEAKER'S PROFILE



MERSIE EJIGU

Mersie Ejigu is a strategic planning and sustainable development expert. Currently, he is member of the Global Steering, IUCN Commission on Economics, Environment and Social Policy-Vice Chair, Africa Region working on transforming economic models to fully capture changes in natural resources. He is also Board Member of Mooddai International Bank (in formation).

Mersie has served his country, Ethiopia, for over twenty years, almost all in one organization, National Development Planning, where he rose from junior expert to head of fiscal and monetary division, head of macroplanning department and then Minister. He has also served as Head of Central Statistics Office, Member of Board, National Bank of Ethiopia and earlier years, and Provisional Insurance Board.

At the international level, his responsibilities included Regional Director, IUCN-The World Conservation Union Eastern Africa, Nairobi; Assistant Director General for Programmes and Policy of IUCN, Switzerland, where he guided and coordinated programmes of over sixty countries. Mersie has also served as Senior Fellow, Foundation for Environmental Security and Sustainability (FESS). For the UN University of Peace, San Jose, Costa Rica, he developed syllabus for and taught environmental security and sustainability assessment as well as environmental insecurity and conflict as graduate level courses.

Mersie has consulted the United

Nations, Department of Economic and Social Affairs, UNDP, UNICEF, World Bank, IMF and UN Foundation on sustainable development policy studies, strategic planning, programme formulation and evaluation. He also consulted UNECA, where he developed Africa's first sustainable development indicators framework and sustainable bioenergy policy framework. For the Africa Union Commission, as Senior Planning Advisor and member of the three person core team of experts, he prepared Agenda 2063. Also wrote, "Tools and Guidelines for Integrating Biodiversity Concerns in Development Planning in Africa."

Through his organization, Partnership for African Environmental Sustainability (PAES), Mersie has extensively worked on environmental security and conflict studies in Uganda, Rwanda, Burundi and Ethiopia covering farming and pastoral communities.

His global speaking engagements include: WTO Tenth Anniversary Symposium on Changing the African Energy Paradigm, Geneva; Weather, Climate Security, Energy and Sustainability (Gold Coast, Australia), European Green Week, Brussels, among others.

Mersie has several publications on issues related to sustainability, environment/climate, energy and water security assessment, policy studies and strategic planning.



DR. EYOB TEKALIGN
TOLINA

Dr. Eyob Tekalign Tolina is currently a State Minister of Ethiopia's Ministry of Finance. Previously, he was Minister in charge of Ethiopia's National Planning Commission. Mr. Tolina has spent over eighteen years helping shape Ethiopia's economic and social development through various responsibilities within leading public, private, supranational, multinational, and academic institutions. Mr. Tolina's diverse background has spanned a variety of roles such as Minister Counselor at the Embassy of Ethiopia in Washington D.C., advisor to the Ethiopian governors of the IMF and World Bank, and his work for different government agencies including Ministry of Foreign Affairs and Ministry of Trade. Mr. Tolina has managed the Ethiopian Public Private Consultative Forum (EPPCF), the major platform for policy deliberation between the government and the private sector in Ethiopia. Mr. Tolina has also worked for a number of regional and international organizations including UNECA, COMESA, UNCTAD, the World Bank Group and the International Finance Corporation (IFC). Mr. Tolina has also consulted for Fortune 500 multinational Dow Chemical and other global companies such as PYXERA Global. Mr. Tolina has served as a director at SGI Frontier Capital, an American investment firm focused on the World's Frontier Markets. Mr. Tolina has a master's degree from the George Washington University in Washington D.C and a PhD from University of Maryland focusing on political economy.



PROFESSOR DESTA
MEBRATU

Professor Desta Mebratu is a chemical engineer by background and has a PhD of engineering in Industrial Environmental Economics from Lund University. He has more than 28 years of experience working for industries, government agencies, universities and international organizations. He worked for United Nations Environment Programme (UNEP) for more than 13 years holding various positions including serving as the Deputy Regional Director for Africa (2011-2016). His main areas of expertise are: resource efficient and cleaner production, sustainable energy systems, sustainable development policies and Green Economy. He has published more than 40 articles in peer-reviewed journals, books and conference reports. He is currently an Associate Professor (Extraordinary) at the Centre for Complex Systems in Transition (CST) and coordinates the research and development programme on 'Distributed Renewable Economy' as a vehicle for Africa's transition to an inclusive, low carbon and resource efficient economy. Professor Mebratu is a Fellow of the African Academy of Sciences (FAAS), Stellenbosch Institute for Advanced Study and Pufendorf Institute for Advanced Studies.



ABSTRACTS

Building Wealthy and Free Ethiopia in 2050: Inclusive Growth and Sustainable Development as Policy Framework and Strategy

Mersie Ejigu

Over the past two decades, Ethiopia has reported substantial economic growth that made the country among the world's best performing economies with an average annual real growth rate of GDP of 11.8 per cent (2004-2008) and 10 per cent (2009-2017).² This was, however, achieved against the backdrop of a stagnating or slow growing manufacturing sector, large youth unemployment, severe income inequality, natural habitat loss, pervasive human insecurity, restrictive flow of trade and movement of capital and labor; social grievances manifested in the form of street protests; and ethnic and religion motivated killings - unfamiliar happenings in a country with such phenomenal economic growth of more than a decade and half.

This paper argues that Ethiopia has both the potential and means to address the above issues, achieve middle income country status and be among the best performing economies and global players by 2050. Whilst Ethiopia's population currently estimated at 110 million is expected to double by 2050, which when combined with mega constraints like climate change, natural resource degradation and habitat loss, undiversified economy, weak infrastructure and markets, land lockedness and narrow manufacturing base, among others, pose massive challenges, all can be transformed into opportunities for wealth creation and technological transfor-

mation through a development strategy of sound governance, inclusive growth and sustainable development.

The paper, then, offers several strategic actions to be taken, which include: (a) de-ethnicization of Ethiopia's governance architecture and society; changing the political narrative from ethnicism to people centered and driven development (job creation, eradication of poverty and famine, access to quality education and health services, etc.); (b) putting in place internally located processes of structural change and transformation to build a strong manufacturing sector that enables Ethiopia to participate at the high end of the global value chain driven by a strong private sector that operates in concert with a smart and efficient public enterprise sector; (c) expanding the asset boundary of aggregate income through caring for, sustainably using and valuing natural resources, developing capital accounts and pursuing sustainable development; (d) building a development oriented capable state with efficient bureaucracy and ensures human security, equal access to justice and prevalence of rule of law and; (e) putting in place robust development planning (short, medium and long term) well-coordinated vertically (from communities, woreda and provinces to national level) and horizontally (across sectors and social groups) anchored in vigorous M&E and accountability system.

Putting a Spotlight on Ethiopia's Economic Idiosyncrasies

Dr Ayele Gelan

Ethiopia's economic idiosyncrasies have received hardly any attention at all levels in Ethiopian studies. The fact that Ethiopia is a desperately poor country seems to have caused researchers to gloss over the issue, with tacit understanding that Ethiopia's economic problems are "well known" and hence it does not deserve any in-depth study. However, the root causes of lack of social progress in Ethiopia can be found deep-seated in varieties of lopsided patterns of

economic development. It is not just Ethiopia's economy has numerous structural imbalances but the imbalances are interrelated, forming synergy and keeping the economy at low level equilibrium trap. In this paper, I would argue that Ethiopia's political and economic reform is very unlikely to succeed unless the authorities address a few critical bottlenecks in the first instance. No matter how much the authorities may try to perfect the arts of economic policy formulation,

standard policy prescriptions are unlikely to pull the country from the current quagmire in the poverty trap. Proceeding to standard economic policy reforms without addressing the fundamental imbalances would be analogous to trying to erect a high rise building without bothering to undertake a proper clearance of debris and necessary

excavations on the site. This paper will identify a few peculiarities in the Ethiopian economy then proceed to in-depth discuss of the ramifications of each idiosyncratic features in turn.

Ethiopia 2050: Population Growth and Development

By Aynalem Adugna

This paper focuses on the link between Ethiopia's population size and growth dynamics on the one hand, and the country's ability to meet ten areas of developmental challenges identified for discussions at the Ethiopia: 2050 conference, on the other. The ten conference themes are – access to clean water, large scale urbanization, food security, sustainability and environment, energy demand, advanced manufacturing, transportation, ICT infrastructure, access to health care, and STEM education – all of whom have a two-way interaction with vital demographic events including births, deaths, and migrations. Baseline data are gathered for all ten developmental variables using online literature search and from four rounds of Ethiopia's Demographic and Health Surveys (DHS). Comparisons are made with a neighboring county of Kenya and the nation of Vietnam - a country that has already achieved "Ethiopia's dream" of becoming a Middle-Income country. Vietnam did so in just over 30 years with, among others measures, reductions in its population growth rate to a mere one percent per year. This was achieved, in part, by increasing women's and girls' completion rate of secondary and higher education to over 70 percent. Its current gross domestic product (GDP) is nearly three times as large as Ethiopia's. Analysis of DHS data and literature survey showed impressive but inequitable economic gains in Ethiopia in the last two and half decades as well as sharp declines in mortality and morbidity. It appears, however, that these gains have not fully caught up with the surge in the country's population size marked by its doubling over the same period. This is, in part, due to anemic reductions in birth rates as shown

by the declining but still high total fertility rate (TFR) – a measure of the number of children likely to be born if the prevailing age specific fertility rate (ASFR) were to hold constant until women currently in their reproductive years reach age 50. Ethiopia's TFR decreased by less than one child during a 16-year period (2000 – 2016) from 5.5 to 4.6. Meanwhile, the built-in population momentum has meant that the cohort of Ethiopian women now in their reproductive years has more than doubled over the last quarter century. A comparison with Vietnam based on age breakdowns shows that Ethiopia's population of females between the ages of 20 and 35 - prime years of reproductivity - which was smaller than Vietnam's in 1950 would be twice as large two decades from now. Our conclusion based on review of the literature is that Ethiopia's socio-economic deliverables of the last 25 years have not caught up with demands brought on by the doubling of its population. This does not mean, however, that the country will not meet the ten developmental challenges slated for discussions at the Ethiopia: 2050 conference. It can, but only if serious measures are put in place to drastically alter the course of its demographic future. The word drastic does not imply forcible control measures as these have been known not be effective, and to have untended consequences. We recommend that the growth rate of the country's population be reduced below its current level of 2.5 percent to approximate the rate in our model country of Vietnam through, among other measures, increases in Ethiopian women's and girls' completion rate of secondary and higher education to over 70 percent.

Sustainability - Energy Pile Foundations for Demands of Buildings

Henok Fikre (Dr.-Ing), at Addis Ababa University,

Addis Ababa Institute of Technology

Samuel Getiye (MSc-Student) at Addis Ababa

University, Addis Ababa Institute of Technology

Over the past two decades, Ethiopia has reported substantial economic growth that made the country among the world's best performing economies with an average annual real growth rate of GDP of 11.8 per cent (2004-2008) and 10 per cent (2009-2017).² This was, however, achieved against the backdrop of a stagnating or slow growing manufacturing sector, large youth unemployment, severe income inequality, natural habitat loss, pervasive human insecurity, restrictive flow of trade and movement of capital and labor; social grievances manifested in the form of street protests; and ethnic and religion motivated killings - unfamiliar happenings in a country with such phenomenal economic growth of more than a decade and half.

This paper argues that Ethiopia has both the potential and means to address the above issues, achieve middle income country status and be among the best performing economies and global players by 2050. Whilst Ethiopia's population currently estimated at 110 million is expected to double by 2050, which when combined with mega constraints like climate change, natural resource degradation and habitat loss, undiversified economy, weak infrastructure and markets, land lockedness and narrow manufacturing base, among others, pose massive challenges, all can be transformed into opportunities for wealth creation and technological transfor-

mation through a development strategy of sound governance, inclusive growth and sustainable development.

The paper, then, offers several strategic actions to be taken, which include: (a) de-ethnicization of Ethiopia's governance architecture and society; changing the political narrative from ethnocism to people centered and driven development (job creation, eradication of poverty and famine, access to quality education and health services, etc.); (b) putting in place internally located processes of structural change and transformation to build a strong manufacturing sector that enables Ethiopia to participate at the high end of the global value chain driven by a strong private sector that operates in concert with a smart and efficient public enterprise sector; (c) expanding the asset boundary of aggregate income through caring for, sustainably using and valuing natural resources, developing capital accounts and pursuing sustainable development; (d) building a development oriented capable state with efficient bureaucracy and ensures human security, equal access to justice and prevalence of rule of law and; (e) putting in place robust development planning (short, medium and long term) well-coordinated vertically (from communities, woreda and provinces to national level) and horizontally (across sectors and social groups) anchored in vigorous M&E and accountability system.

በሰሜን አገራት የአህል ሰብል ምርታማነት ከ 60 ኩንታል በሄክታር በላይ ቢያድግም፣ የኢትዮጵያ አርሶ-አደር የዘመናዊ ግብርና ጥበብ ዕውቀት መጠነኛ በመሆኑ የሰብል ምርታማነቱ ወደ 20 ኩንታል በሄክታር አካባቢ ነው። እንዲያውም፣ የ2011 የግብርና አፈጻጸም ዘገባ [2] እንዳሳየው፣ የ2011 የምርት ዘመን ምርታማነት መቀነስም ታይቶታል። በሌላ በኩል፣ የግብርና ልማት መርሆችን ሰፊ መሬት ከከፍተኛ ተጨማሪ ድጋፍ ጋር ለኢንቬስተር በሊዝ መስጠቱ፣ ከገጠሩ አርሶ-አደር የመሬት መጠብብና በገጠር ለወጣቱ መሬትም ሆነ ሥራ ባለመኖሩ ወደ ከተሞችና ሌሎች አገሮች ፍልሰት ጋር የልማት መርሆ የተጣጣመ አይደለም፤ ይህ መርሆ ካላገራዊ ጥቅምና ደህንነት አኳያ እንደገና ሊፈተሽ ይገባል።

በግብርና ምርታማነት ችግር ላይ በመገናኛ ብዙሀን ተደጋግሞ እንደተነገረው፣ የምርጥ ዘርና የማዳበሪያ አቅርቦት ማጠርና ከአትራፊ ነጋዴዎች መገዛቱ ከፍተኛ ጫና መፍጠሩና የማዳበሪያ ዕዳ መክበድም በሰብል ምርታማነት ላይ ተፅዕኖ ሳያደርግ አልቀረም የሚል ግምት አለ፤ ብዙ የአርሶ-አደር ልጆችም ወደ አዲስ አበባ የሚመጡት ለማዳበሪያ ዕዳ መክፈያ ገንዘብ ፍለጋ መሆኑን ይናገራሉ። የምርትና የሕዝብ ዕድገት አለመመጣጠንና፣ በ2011 ዓ.ም. ብቻ የ 11.1 ቢሊዮን ብር ስንዴ ተገዝቶ ወደ አገር በመጣባት ላይ መሆን (ኢ.ቲ.ቪ. 27/12/2011)፤ በአሮሚያም 10 ዞኖችና 90 ወረዳዎች የሴፍቲኔት ተጠቃሚዎች መሆን (ኢ.ቲ.ቪ. 27/12/2011)፤ የምግብ ዋስትና ላይ ችግር እንዳለ ያመለክታሉ። ይህ የምግብ ዋስትና አለመኖር፣ ለዋጋ ግሽበት መኖርና ለኑሮ ውድነት፣ እንዲሁም ለወጪ ንግድ ከዓመት ወደ ዓመት መቀነስ፣ ለውጭ ምንዛሪ ከፍተኛ ዕጥረትና ለአግሮ-ኢንዱስትሪ መጋቢ ምርት አለማግኘት ዳርጎን፣ ከስንዴ ሌላ የምግብ ዘይት፣ ጥጥ፣ የቢራ ገብስ፣ ፍራፍሬ፣ ሌላም በአገር በስፋት ሊመረት የሚችል ከውጭ አገር መግዛት አስፈላጊ ሆኗል።

ብዙ በየፈርጁ የሚሠራ ሥራ ያላት አገራችን፣ ሥራ-ፈጣሪ ትውልድ በማፍራት ፈንታ የትምህርት ሥርዓቱ የአገር ዕድገት ዓላማ ባለመያዙ፣ ትምህርት ለልማት መሣሪያ ከመሆን ይልቅ ለፖለቲካ ትርፍ መዋሉና የትምህርት ጥራት ውድቀት፣ ምናልባትም በትምህርቱ ውጤት ተስፋ በማጣት የወጣቶች በብዛት ከት/ቤት መቅረት (በአማራ 20% ቀሩ ተባለ፤ የአማራ ቴሌቪዥን፣ 2011)፣ ባለፉት 4 ዓመታት ት/ሚኒስቴር 10.7 ቢሊዮን ብር ለክልሎች ድጎማ ሰጠው ቢልም (ኢ.ቲ.ቪ. 2011) በምርት ጥራት ላይ ለውጥ አለመጠቀም እጅግ ጎጂ ከስተቶች ናቸው። ይህ ዓይነት ደካማ አሠራር በትምህርት ሥርዓቱ ላይ ብቻ ሳይሆን በግብርናውም ከብዙ ሺ ዓመታት አመራረት ሥርዓት ባለመላቀቃችን፣ የሕዝባችን ቁጥር እያደገ ሲመጣ ዘመናዊ አመራረት አብሮ እንዲመጣ እንደ አገር ጥንቃቄ ባለማድረጋችን ራሳችንን መመገብ መቸገር ከጀመርን ቆይቷል።

የወጣት ምሩቃን ሥራ-አጥነትና የልጆች ከትምህርት ቤት መቅረት፣ የገጠሩ ልማት ለዘመናት ለውጥ አለማየትና የድህነት መባባስ፣ (በ2011 8.3 ሚሊዮን ሕዝብ የምግብ ዕርዳታ ተሰጠ - ኢ.ቲ.ቪ.፣ 2011)፣ የምርጥ ዘርና (በደቡብ፣ በአማራ፣ ኢ.ቲ.ቪ 2011)፣ የማዳበሪያም ዕጥረት (ኢ.ቲ.ቪ.፣ 2011) መከሰት፣ በስንት ችግር ላመረተው አርሶ-አደር የምርትና ገበያ

ትሥሥር አለመኖር (ኢ.ቲ.ቪ.፣ 2011)፣ በረና፣ ደቡብ ጎንደር፣ ደቡብ ወሎ፣ የኩንታ ልዩ ወረዳ ንብ አናቢዎች፣ የዳውሮ ዞን ምርጥ ዘር ማጣትና በውድ ከነጋዴ ኢንዱዛ መገደድ፣ የሰሜን ሸዋና የአረሚያ ሸንኩርት አምራቾች፣ ወዘተ)፣ ከግብርና ሚኒስቴር አናሳ ዓመታዊ ባጀት ጋር ግብርናችን ብዙ ችግሮች እንዳሉበት [2] ይታያል። ይህም በ2011 የምርት ዘመን ዘገባና በ2007-2011 ዓመታዊ ምርት [2,3] ዕድገት መዳከም ላይም ተንጸባርቋል።

የዚህ የግብርና ችግር አንዱ አስከፊ ውጤት መሬት የሌላቸው ሥራ-አጥ የገጠር ወጣቶች አንድም ወደ ከተማና ወደ ውጭ አገር አደጋ የሞላበት ስደት ላይ ሲሆኑ፣ በአካባቢያቸው የቀሩት ደግሞ አንዳንዶች በመጠጥ ልማድ እንደተለከፉ፣ ከፊሎቹ ደግሞ በሌብነት እንደተሰማሩ የቅርብ ጥናቶች [11] አመልክተዋል። ዛሬ ላይ ለገጠር ሥራ-አጥ ወጣቶች የሚከፋፈል ተጨማሪ መሬት ስለሌለ፣ የሕዝብ ዕድገትም ቀጣይ ስለሚሆን፣ የትምህርት ሥርዓቱም ቀጣይ ስንኩልነት ተጨምሮበት፣ የገጠሩ ወጣት ሥራ-ፈት፣ ጠጪና ሌባ የመሆኑ ችግር እየጨመረ እንጂ እየቀነሰ ስለማይሄድ፣ ብዙ ሳይመሸብን የሥራ ዕድል በመፍጠር ለችግሩ አስቸኳይ መፍትሔ መፈለግ አለብን።

ለዚህም የሚበጀው፣ በአንድ በኩል አርሶ-አደሩን ወደ ዘመናዊ አምራችነት አፋጥኖ ማሸጋገርና ምርታማነትን አሳድጎ የገበያ ትስስሩን መገንባትና ዋጋ ማረጋገጥ፣ በሌላ በኩል የገጠር የልማት ተቋማትን አግባብ ካለው ሥልጠና ጋር ማስፋፋት ለምግብ ዋስትናችንና ለኢኮኖሚውም ጤናማ ዕድገት ወሳኝ ናቸው። ሁለቱም ምናልባት የኢንዱስትሪ ፓርክን ያህል ወጪ ሳይጠይቁ፣ አገራችን ከ1996 እስከ 2005 የመደበኛውን 15 በመቶ የግብርና ባጀት የዛሬውን 3.75 በመቶ ባጀት በመተካትና ሥራ-ወዳድና ብቁ ሠራተኞችን አሰማርቶ፣ በከፍተኛ ደረጃ የመንግሥት ጥብቅ ቁጥጥር በማድረግ ውጤታማ መሆን ይቻላል ተብሎ ይታመናል። ግብርናው እስኪጠናከርና ከዛሬው ችግር እስክንወጣ፣ ጠንካራና ተከታታይ የመንግሥት ባጀትና የቅርብ ህይደትም የመንግሥት ክትትልና ቁጥጥር ግዴታ ይሆናል። ለም መሬት፣ ሰፊ የውሀ ሃብትና እጅግ ታታሪ የሆነ አርሶ-አደር ይዘንም ቢሆን፣ ከሠራው ዜጋ ቀምቶ በማከፋፈል የሠራውን በማራቁትና ያለግል ከፍተኛ ጥረት ምንጊዜም ልማት አይመጣም።

የግብርና ባጀት ከ1996-2005 የ15 በመቶ ድርሻ፣ በ2012 ወደ 3.75 በመቶ የወረደው፣ ምናልባት አገራዊው ባጀት በማደግ የገንዘቡ መጠን ጨምሯል በሚል እሳቤ ከሆነ፣ አንድም የግብርናው ድርሻ ወደ 3.75 በመቶ ስለወረደ፣ ሁለተኛው ከፍተኛ የዋጋ ግሽበት የ2012 ን የብር የመግዛት አቅም የ 1995 ን 20 ሣንቲም ያህል እንዲሆን ስለደረገው፣ ሶስተኛው ከሕዝብ ዕድገት ጋር የገጠመን አደገኛ የምግብ ዋስትና ማጣትና የውጭ ምንዛሪ ችግር ከፍተኛ የልማትና የደህንነት ማንቆ በመሆናቸው፣ የግብርናው ዓመታዊ ባጀት ድርሻ ወደ ቀድሞው 15 በመቶ አካባቢ ከፍ ሊል ይገባዋል። ሕዝባችን ከመንግሥት የሚጠብቀው ከሰላም ማረጋገጥ ቀጥሎ ለሕይወቱ ዋስትና የሆነ በቂ ምግብ ማግኘት ነው።

Putting a Spotlight on Ethiopia's Economic Idiosyncrasies

Dr Ayele Gelan

Ethiopia's economic idiosyncrasies have received hardly any attention at all levels in Ethiopian studies. The fact that Ethiopia is a desperately poor country seems to have caused researchers to gloss over the issue, with tacit understanding that Ethiopia's economic problems are "well known" and hence it does not deserve any in-depth study. However, the root causes of lack of social progress in Ethiopia can be found deep-seated in varieties of lopsided patterns of economic development. It is not just Ethiopia's economy has numerous structural imbalances but the imbalances are interrelated, forming synergy and keeping the economy at low level equilibrium trap. In this paper, I would argue that Ethiopia's political and economic reform is very

unlikely to succeed unless the authorities address a few critical bottlenecks in the first instance. No matter how much the authorities may try to perfect the arts of economic policy formulation, standard policy prescriptions are unlikely to pull the country from the current quagmire in the poverty trap. Proceeding to standard economic policy reforms without addressing the fundamental imbalances would be analogous to trying to erect a high rise building without bothering to undertake a proper clearance of debris and necessary excavations on the site. This paper will identify a few peculiarities in the Ethiopian economy then proceed to in-depth discuss of the ramifications of each idiosyncratic features in turn.

Transformational infrastructure for inclusive and sustainable development in Ethiopia

Professor Desta Mebratu

Ensuring the wellbeing of a population that is projected to reach 130 million by 2030 (CSA, 2013) in a resource and carbon constrained world would require a speedy transition to an inclusive, low carbon and resource efficient society. Ethiopia's ability to make such a transition is highly dependent on the kind and quality of infrastructure it develops in the coming years and decade. Besides the ecological constraints, existing and emerging knowledge and technology systems related to the fourth industrial revolution pose multiple challenges while at the same time provide unique

opportunities of leapfrogging. This paper argues that Ethiopia's ability to develop transformational infrastructure that could facilitate the transition to an inclusive low carbon and resource efficient economy is dependent on its capacity to effectively manage the tensions between the lock-in and leapfrogging effect of infrastructural development. It also highlights the key factors and strategic issues that need to be considered in relation to the development of key infrastructures such as energy, industry and urban



NOTES

GRAND CHALLENGES AND OPPORTUNITIES

DECEMBER 19 & 20, 2019

ኢትዮጵያን ለማድረግ

ETHIOPIA 20
50

GRAND CHALLENGES AND OPPORTUNITIES

