

ENERGY-FOOD-WATER SECURITY NEXUS IN VIET NAM

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CERTIFICATE OF AUTHORSHIP/ORIGINALITY

I, Thi Anh Phuong Nguyen declare that this thesis, is submitted in fulfilment of the requirements for the award of Doctor of Philosophy, in the School of Information, Systems and Modelling at the University of Technology Sydney.

This thesis is wholly my own work unless otherwise reference or acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis. This document has not been submitted for qualifications at any other academic institution. This research is supported by the Australian Government Research Training Program.

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ABBREVIATIONS/GLOSSARY

ADB	Asian Development Bank
ADV	Advanced Scenario
APEC	Asia - Pacific Economic Cooperation
ASEAN	Association of South East Asian Nations
BCE	Before the Common Era
CES	Constant Elasticity Substitution
CGE	Computable General Equilibrium
CLEW	Climate, Land, Energy, and Water
CO ₂	Carbon Dioxide
CPV	Communist Party of Vietnam
DO	Diesel Oil
DSI	Data Sciences International
ECHAM4	European Centre Hamburg Model, 4 th edition
E-F-W	Energy-Food-Water
ESCAP	The United Nations Economic and Social Commission for Asia and the Pacific
EVN	Vietnam Corporation of Electricity
FAO	Food and Agriculture Organization
FEM	Fixed Effects Model
GDP	Gross Domestic Product
GMS	Greater Mekong Sub-region
GSO	General Statistics Office
GSOVN	General Statistics Office of Vietnam
GW	Giga Watt
ICOR	Incremental Capital and Output Ratio
IEA	International Energy Agency
IFS	International Food Standard
IGCC	Integrated Gasification Combined Cycle
IMF	International Monetary Fund
IO	Input–Output
KVA	Kilo Volt-Ampere

Laos' PDR	Laos Peoples Democratic Republic
LCA	Life Cycle Analysis
MARD	Ministry of Agriculture and Rural Development
MENA	Middle East and North Africa
MOD	Moderate Scenario
MOIT	Ministry of Investment and Trade
MONRE	Ministry of Natural Resources and Environment
MW	Mega Watt
NSSO	National Sample Survey Office
NSW	New South Wales
OECD	Organisation for Economic Co-operation and Development
REM	Random Effects Model
SC1-BAU	Scenario 1 - Business as Usual
SC2-Energy	Scenario 2 - Energy
SC3-Food	Scenario 3 - Food
SC4-Water	Scenario 4 - Water
SC5-E-F-W	Scenario 5 - Energy- Food- Water
SC6-Low Carbon	Scenario 6 - Low Carbon
SERC	South-East River Cluster
TOE	Tonnes of Oil Equivalent
UN	United Nations
UNDP	United Nations Development Programme
UNEP	The United Nations Environment Programme
USDA	United States Department of Agriculture
VCGM	Vietnam Competitive Generation Market
VCP	Vietnam Communist Party
WB	World Bank
WEM	Water-Extraction Mechanism

ABSTRACTS

The security of Energy, Food and Water (EFW) – basic human necessities – have lately emerged as a key policy challenge for the Vietnamese policy-makers. This research is premised on the argument that current policy focus for ensuring EFW security is deficient as it is based on siloed thinking, neglectful of the complex, multifaceted, interlinkages (nexus) between EFW, the economy, the society and the environment. An integrated approach to policy, informed by the nexus will therefore be needed to redress the security challenge. Against this backdrop, this research analyses the impacts of alternative developmental pathways (scenarios) on EFW security and the economic, social and environmental domains for Vietnam for the period 2014-2030. These scenarios represent different policy foci, for example; SC1-BAU (Business-as-Usual) Scenario representing continuation with existing policy trends; SC2 Scenario emphasising energy security; SC3 Scenario – food Security; SC4 Scenario – water security; SC5 Scenario – EFW security; and SC6 Scenario – EFW security with specific priority on the environment. Each scenario is underscored by its own technological, economic and other assumptions which are broadly in accord with the current or likely trends in Vietnam. The EFW security and wider impacts of each scenario are assessed in this research through the application of an EFW-security-extended input-output based integrated framework (model), specifically developed for this research. The analyses of these impacts suggest that continuation with existing policy trends will produce detrimental EFW security, and economic, social and environmental outcomes for Vietnam. SC2, SC3 and SC4 scenarios (emphasising energy, food and water security, respectively) will produce superior outcomes in their specific domains but inferior outcomes in other domains (for example, in the S2 scenario energy security will improve appreciably, but at the expense of food and water security). The nexus scenarios (i.e., SC5 and SC6), while producing the best overall EFW security and overall economy-wide outcomes, do offer distinctive choices. SC5 produces extremely positive EFW security and economic and social, but relatively inferior environmental (CO₂ emissions), outcomes; SC6 on the contrary produces considerably positive EFW security, social and environmental outcomes, but relatively lower economic outcome (with approximately one percent lower GDP in comparison with SC5 scenario). Such insights into the impacts of various (nexus and non-nexus scenarios) and, more pertinently, associated trade-offs across the scenarios, should – it is contended – provide the Vietnamese policy makers a much robust platform to inform their policy choices to promote EFW security, while ensuring the much-needed socio-economic development of the nation.