

The background of the slide is a composite image. On the left, there are several white wind turbines with three blades each, set against a blue sky with light clouds. On the right, there are solar panels in the foreground, with a bright sun low on the horizon, creating a lens flare effect. The sun is positioned between the wind turbines and the solar panels, casting a warm glow over the scene.

# Accounts for renewable energy assets

Presented by Robert Smith, Midsummer  
Analytics and Grzegorz Peszko, World Bank

20<sup>th</sup> Session  
UNECE Group of Experts on National Accounts  
17, 18, 20, 21, 25 and 26 May 2021 (online)

# Renewable energy assets: scope and motivation

World Bank: comprehensive wealth accounts for 140+ countries;

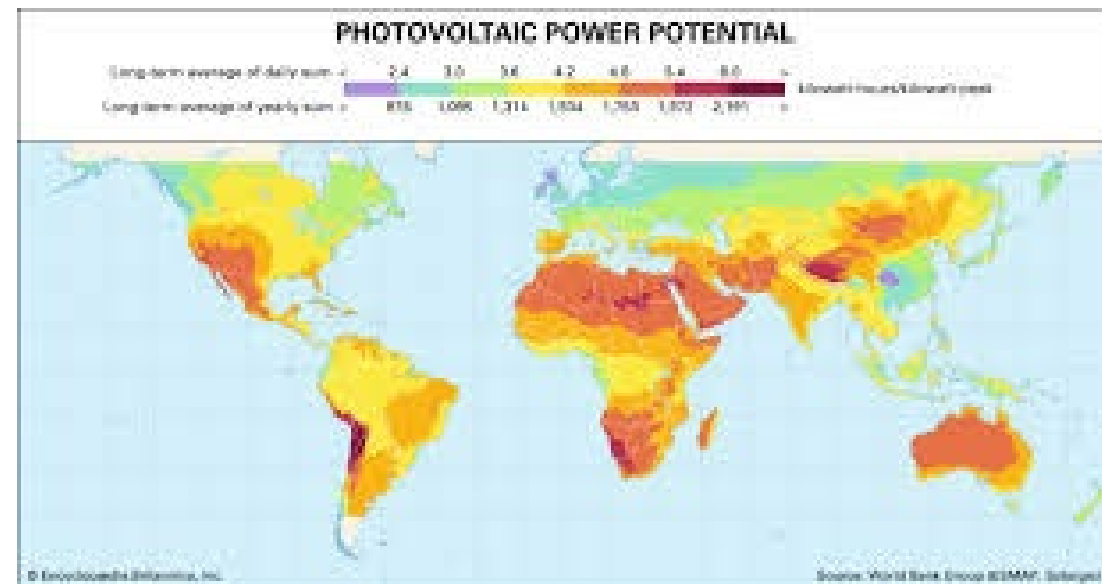
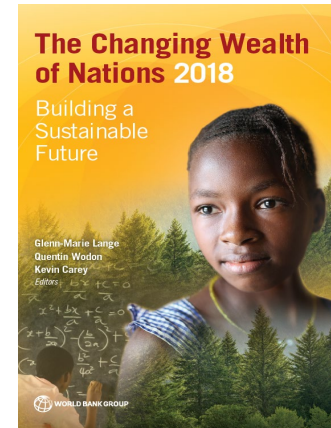
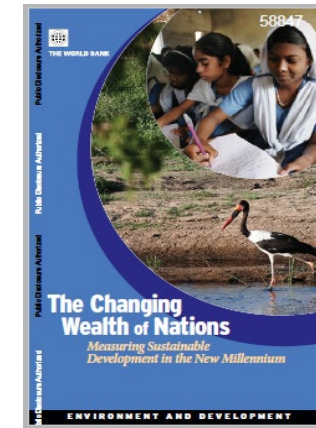
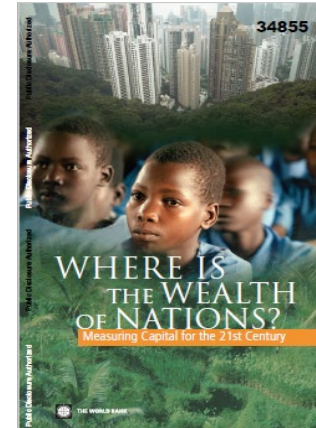
Next update: *“The Changing Wealth of Nations 2021: From Accounting to Managing Assets”*

Renewable energy—hydro, wind, solar, geothermal resources— **too important** to omit from national balance sheets

- Fastest growing sector of electricity sector
- Already accounts for >20% of global capacity (IEA)

CWON will include renewable energy assets in its next update (2023):

- hydro, geothermal, wind and solar



# Treatment of renewable energy assets in SNA and SEEA-CF<sup>1</sup>

**SNA** does not address renewable energy assets (implies they are not assets because ownership rights cannot be enforced)

**SEEA-Central Framework (CF):** renewable energy is an **attribute of land**, not a distinct asset, and its asset value is captured in the value of land

Specialized SEEA manuals, **SEEA Energy**, **SEEA Experimental Ecosystem Accounting** do not address asset value



1. See Smith, R., B. Filewod and K. McDougal, 2021, *Valuation of Renewable Energy Resources in the Context of the Changing Wealth of Nations – Conceptual and Methodological Considerations*, Draft Report prepared for the World Bank.

# Problems with SEEA-CF approach to renewable energy assets

SEEA-CF treats renewable energy resources as an attribute of land, but,

- Some renewables are not associated with land—offshore wind, solar, ocean resources
- Often associated w/ land that has no economic value and does not appear in SEEA-CF or SNA (hydro, large-scale solar/wind)
  - Not clear why the value of solar/wind farms on zero-value land should be attributed to land rather than to the resource itself
- Geothermal: ownership rights may be separated from land rights
- Not consistent with treatment of some other natural resources, e.g., standing timber valued separately from the land on which it is grown



# Closer look at natural resource assets in SNA and SEEA-CF

Natural resources have evolved to meet both SNA and SEEA-CF asset definition: ownership rights, generation of economic benefits (SEEA-CF does not require private economic benefits)

Natural resources currently recognized as asset by SNA:

- Land (including associated soil, surface water)
- Mineral & energy resources
- Biological resources that grow naturally
- Surface and groundwater
- Electromagnetic (radio) spectrum

SEEA-CF separates land into soil and 'space'; does not recognize the radio spectrum ("not part of biophysical environment")

# Radio spectrum in the SNA as a model for treating renewable energy assets?

Inclusion of radio spectrum in SNA is quite recent, coinciding with the rise of cell phone industry,

Billions of \$ of public revenues generated from auction of radio spectrum

Ownership:

- Spectrum is owned—govt awards licenses
- Spectrum is rival—users can disrupt/degrade others' signals, but cannot physically prevent use

Economic benefit: used by telecomms industry as a natural resource asset

Renewable energy assets generate economic benefits and are under ownership/control

# Proposed approach to renewable energy resources as assets

*Table 1 - Suggested additions to SNA and SEEA-CF natural resource asset classifications*

<b>SNA</b>	<b>SEEA-CF</b>
<i>Land</i>	<i>Mineral and energy resources</i>
<i>Mineral and energy reserves</i>	<i>Land</i>
<i>Renewable energy resources</i>	<i>Soil resources</i>
<i>Non-cultivated biological resources</i>	<i>Renewable energy resources</i>
<i>Water resources</i>	<i>Timber resources</i>
<i>Other natural resources</i> - <i>Radio spectra</i> - <i>Other</i>	<i>Aquatic resources</i>
	<i>Other biological resources</i>
	<i>Water resources</i>

**Note:** Suggested additions shown in green.

Important to avoid any potential double-counting where land value may include value of renewable energy resources.

# Approaches to valuation of renewable energy assets

**Least-cost alternative:** estimate the rent that would be generated by the least-cost alternative source of energy

Very complex to implement (see Canadian examples)

**Residual value:** assumes markets approximate long-run equilibrium so that the residual value method accurately measures rents

Consistent with widely applied approach to natural resource rents in both SNA and SEEA-CF where markets for assets are lacking

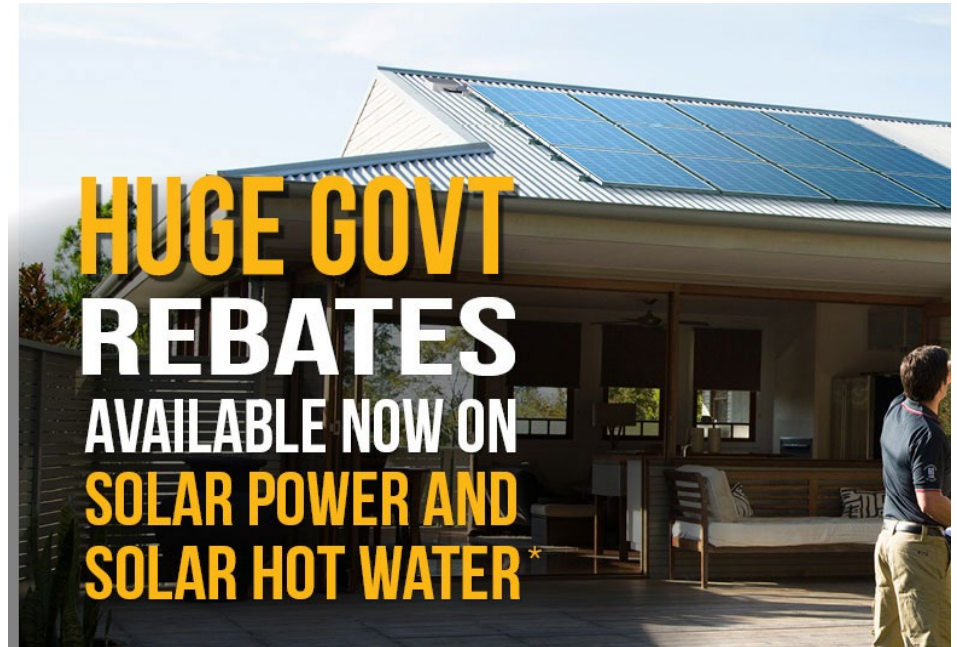
Challenges when applied to renewable energy resources:

Adjusting for market distortions that arise from, for example,

- Heavy subsidization of energy production & consumption
- Uncertainty about legal, regulatory environment

Costs of intermittency/grid integration costs

**Our proposal:** use residual value approach





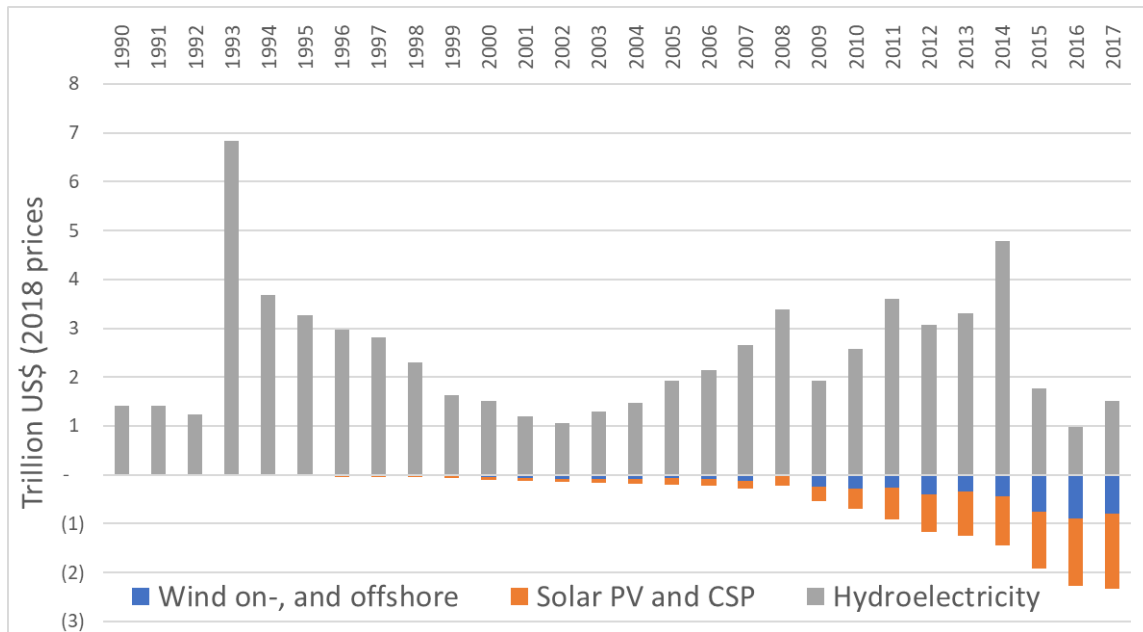
# Pilot study on value of renewable energy assets: hydro, solar & wind

- Pilot estimates for 15 countries<sup>1</sup>
- Scenarios of value of RES assets in 2 countries under policy scenarios, e.g. carbon prices

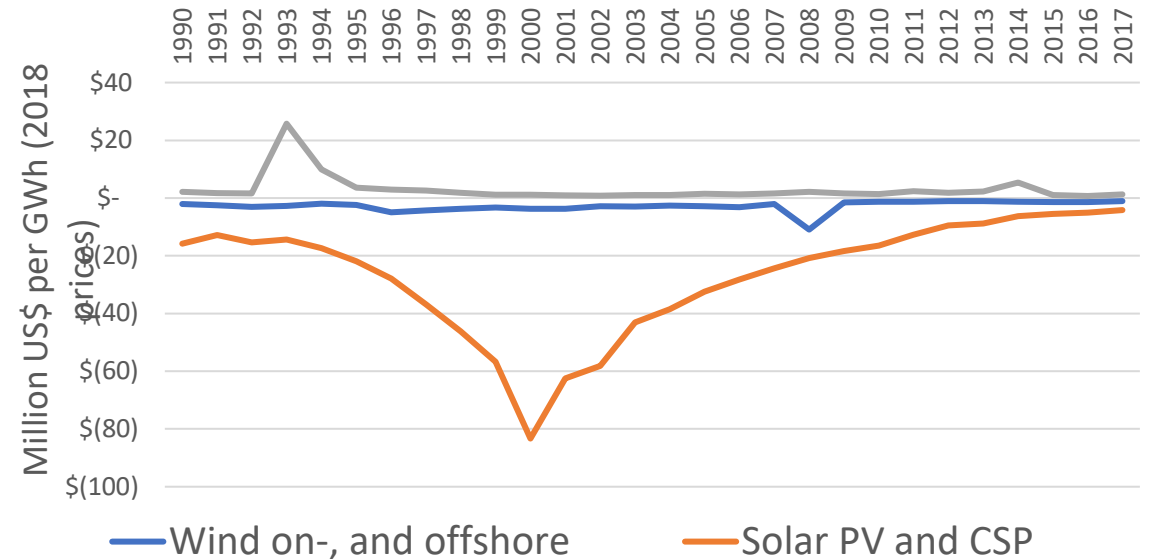
1. See Smith, R. and A. Ilias, *Valuation of Renewable Energy Resources in the Context of the Changing Wealth of Nations, Experimental Results*, Draft report prepared for the World Bank.

# Renewable energy is a large unaccounted wealth that can increase in value with efficient market and climate policies

**Total renewable energy wealth in 15 countries 1990-2017**



**Average unit solar & wind wealth (per GWh) in 15 countries**



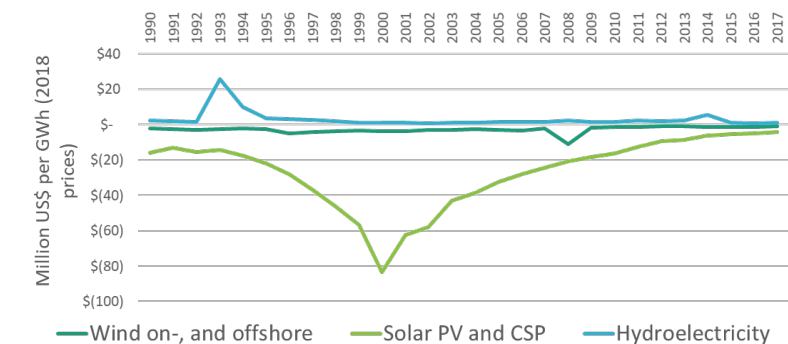
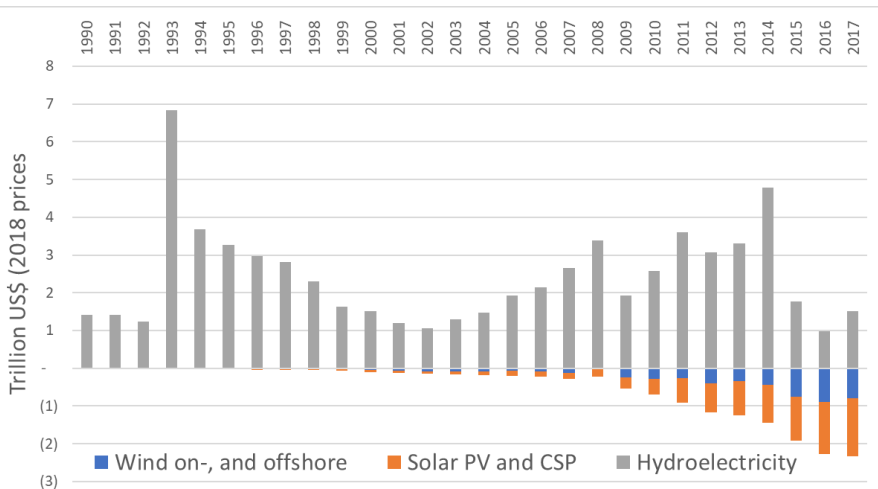
- Hydroelectricity assets have mostly positive though volatile values, matching the value of fossil fuel assets in Canada and Brazil
- Solar and wind energy assets still have mostly negative values as nascent, subsidized but fast-growing industries with rapidly maturing technologies
- Unit solar and wind wealth are approaching positive values

# Pillar 1: Example of Renewable energy – from accounting to policies

## 1.4. Wealth accounts

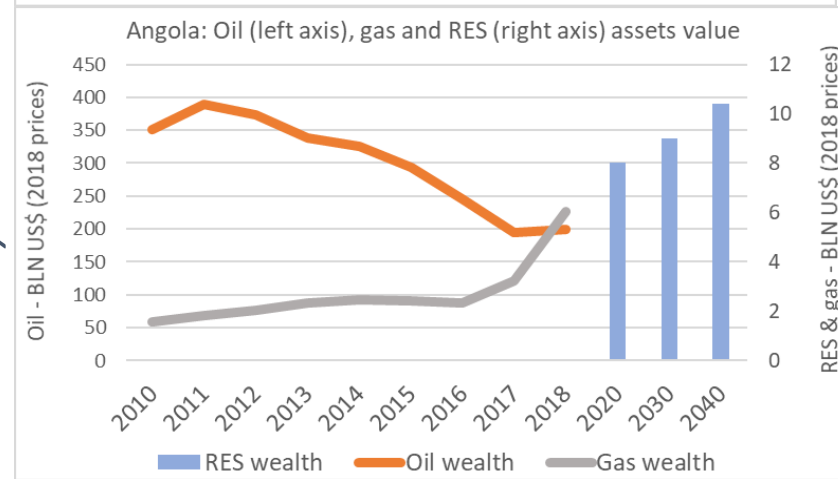
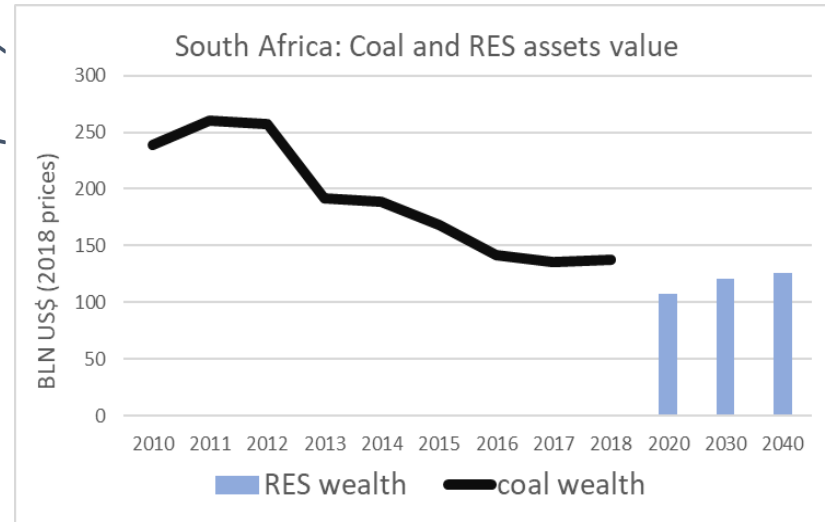
**CWON 2021-** Pilot accounts of renewable energy assets for 15 countries 1990-2017

**CWON 2023** – Full coverage in Core Accounts



## 1.3 Policy

*Comparison of fossil fuel with simulated renewable electricity asset values under alternative policy reforms*



## Operations

Informing portfolio of WB SCDs, CPFs, Energy projects

# Thank you

Robert Smith, Principal  
Midsummer Analytics  
[www.midsummer.ca](http://www.midsummer.ca)  
[rob@midsummer.ca](mailto:rob@midsummer.ca)  
+1-613-716-5230

Grzegorz Peszko, Lead Economist  
Environment and Natural Resources  
World Bank  
[gpeszko@worldbank.org](mailto:gpeszko@worldbank.org)