Focus group discussions August 19th and October 21st 2021

A2A Indonesia
summary of results

Replacing Suralaya coal with solar PV
Fair and inclusive transition

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Ambition to Action

Project introduction

Ambition to Action (A2A)

Ambition
to
Action

Project introduction Ambition to Action (A2A)

The Ambition to Action (A2A) project **offers analytical support to governments in partner countries** to accelerate the development and implementation of their Nationally Determined Contributions (NDCs).

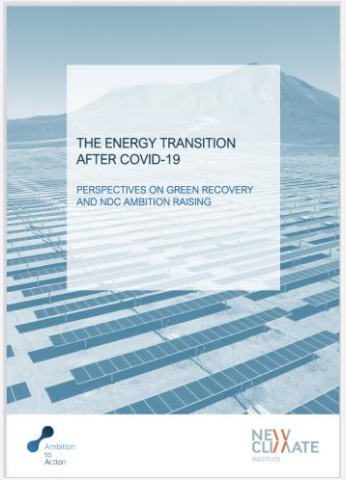
In the **second phase** of Ambition to Action Indonesia (May 2020 to March 2022), the team together with Bappenas, will jointly investigate distribution of co-benefits and inclusiveness of the energy transition;

https://ambitiontoaction.net/partner-countries-indonesia/

Supported by:

Federal Ministry
for the Environment, Nature Conservation
and Nuclear Safety

based on a decision of the German Bundestag



The energy transition after COVID-19 was developed in collaboration with Bappenas. Click here to download [link]

A2A is funded under the German International Climate Initiative (IKI) and runs until 2022

Rapid replacement of Suralaya coal by solar PV

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Three scenarios

- Coal-based baseline scenario
- Affordable and reliable scenario (utility focus)
- Fair and inclusive scenario (rooftop focus)

3.4 GW

Suralaya **coal** power

is rapidly replaced by

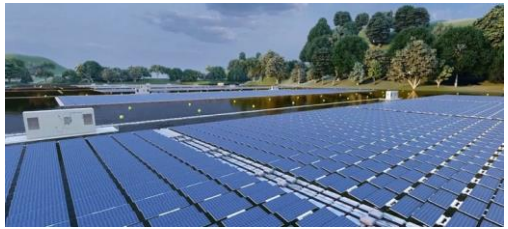
to generate the same

21 TWh

per year

>10 GW

grid-connected **solar-PV**



Rapid replacement of Suralaya coal by solar PV

Ambition to Action

Three scenarios

- Coal-based baseline scenario
- Affordable and reliable scenario (utility focus)
- Fair and inclusive scenario (rooftop focus)

- The study aims to give a **sense of the size and direction** of socio-economic impacts associated with a real-world case study, such as Suralaya
- We modelled a coal-based baseline and **two solar PV scenarios**: *affordable and reliable* (utility focus), and *fair and inclusive* (rooftop focus).
- We present impacts across development indicators (**SDGs**) to show how changing from coal to solar PV can bring greater prosperity to Indonesia (FGD August 19th 2021)
- Based on analysis of the energy sector and a series of stakeholder interviews, we identify **barriers and enablers** and we make **suggestions on actions** different stakeholders could make to make this a reality and contribute to an inclusive green push for solar PV (FGD October 21st 2021)

Analysis: preliminary results

Focus Group Discussion August 19th, 2021

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Initial results: Costs of generating electricity

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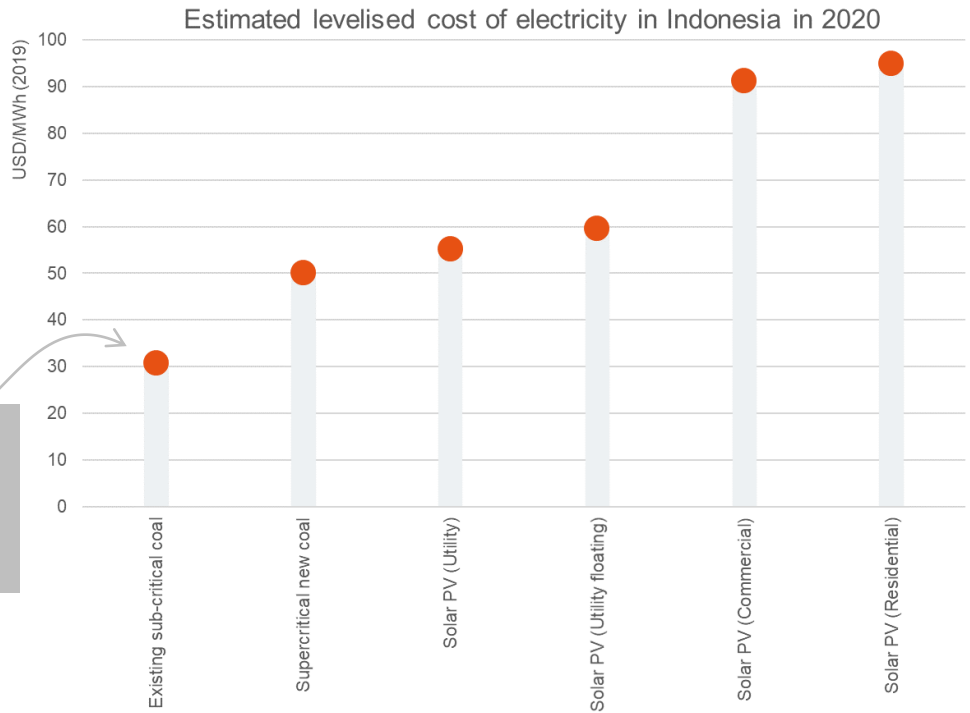
Energy security analysis: electricity generation costs



Excludes capital investment costs, e.g. continued operation of Suralaya

- Simplified analysis based on 10% cost of capital estimates for all technologies
- Low cost of new supercritical coal depends on fuel costs below international market prices and no domestic carbon price
- Utility scale solar PV installations are currently notably cheaper to install and operate per kWh than industrial and residential (rooftop) units

Simplified LCOE estimates based on central cost estimates for 2020 in: *Technology Data for the Indonesia Power Sector: Catalogue for Generation and Storage of Electricity* (Feb 2021)

Initial results: GHG Emission reduction

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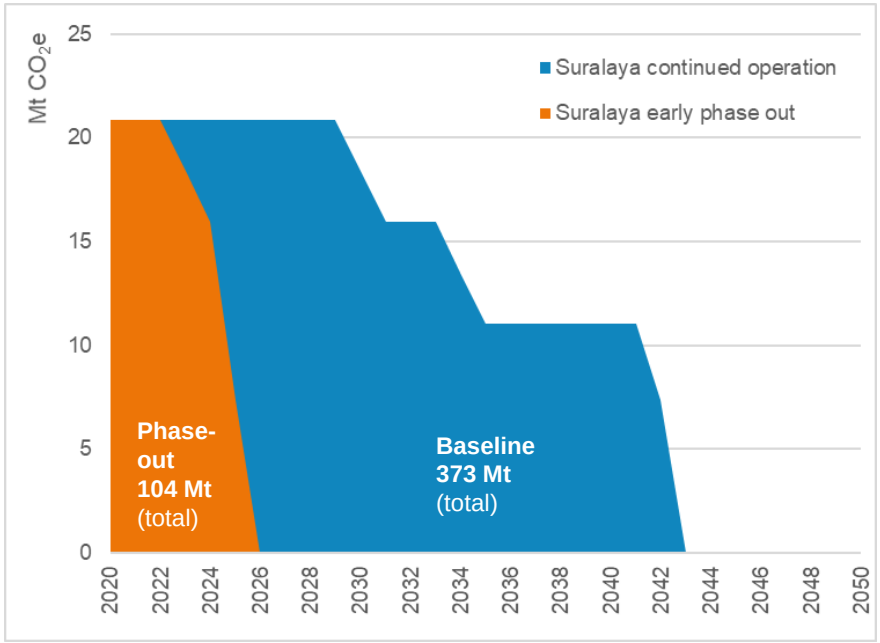
Climate impact: GHG emissions



- Simplified analysis based on 1 kg/kWh for coal
- Early Suralaya unit 1-7 phase out could contribute 5-7% of Indonesia's 2030 commitment for energy sector emission reductions

13 PENANGANAN PERUBAHAN IKLIM

Climate action co-benefits: The ‘What and Who?’

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	SDG categories	Impacts
	**Health and well-being**	• Air pollution • YLL and illness
	**Affordable and clean energy**	• Production/ capacity • LCOE
	**Decent work and economic growth**	• Job years • GDP contribution
	**Industry, innovation, and infrastructure**	• Industry turnover • SME turnover • Infrastructure investments
	**Climate action**	• GHG mitigation

Distribution key	Households	Businesses
Location	X	X
Age	X	
Gender	X	
Health vulnerability	X	
Domestic/ International		X
Sector		X
Household/dwelling type	?	
Income/social bracket	?	
Business specifics		?
Energy security indicators?	?	?

Climate action co-benefits: SCAN-tool for SDG linkages

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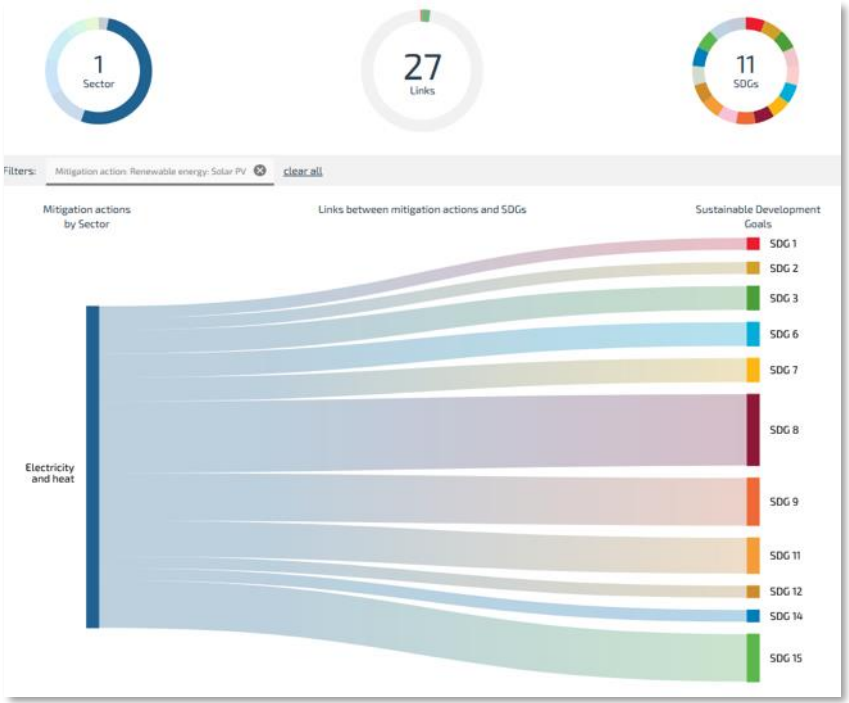
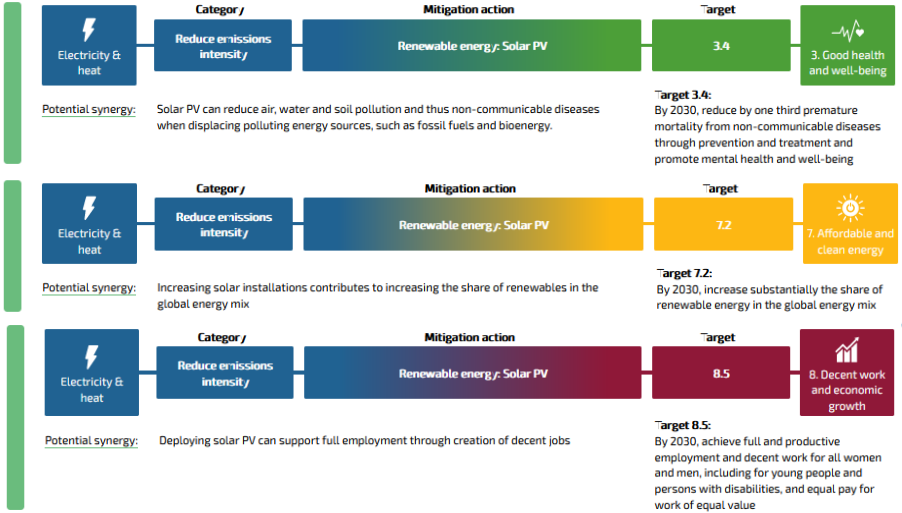
Synergies with the Sustainable Development Goals





Analysis based on SDG Climate Action Nexus (SCAN) tool: https://ambitiontoaction.net/scan_tool/

Climate action co-benefits: SCAN-tool for SDG linkages

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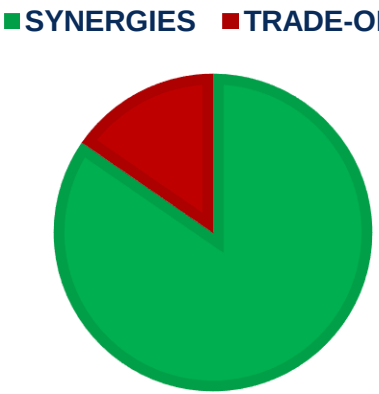
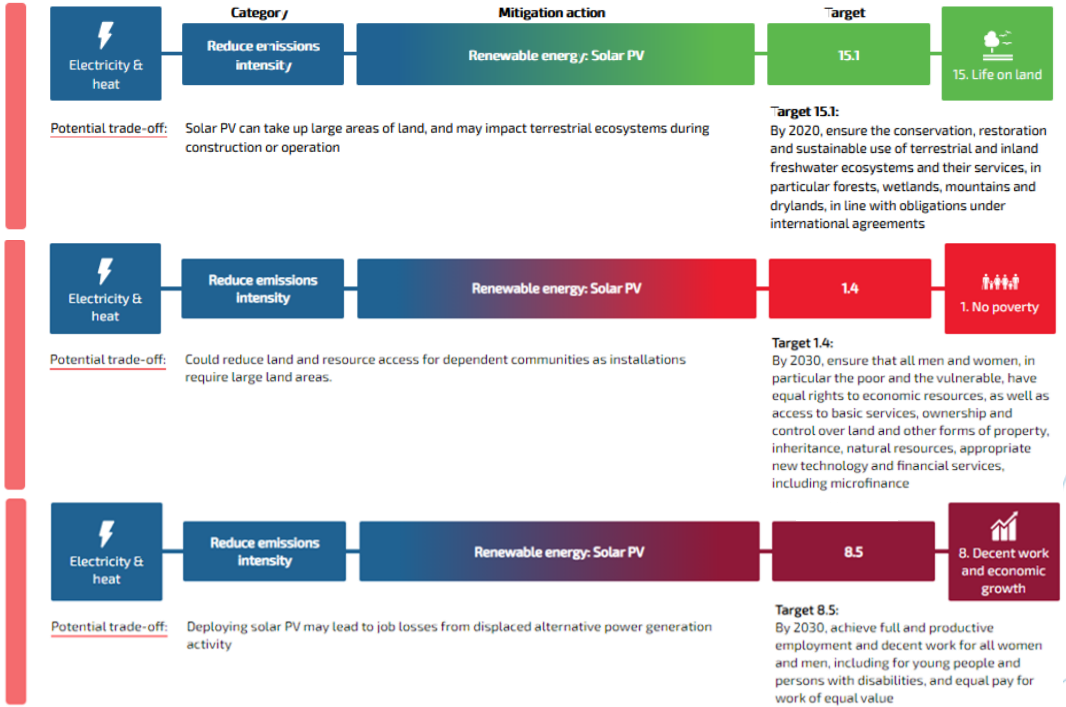
Potential trade-offs



- **Synergies** with the SDGs and wider sustainable development objectives **clearly outweigh potential trade-offs**
- However, it is important to consider these trade-offs to **counter potential negative impacts and facilitate a just transition**

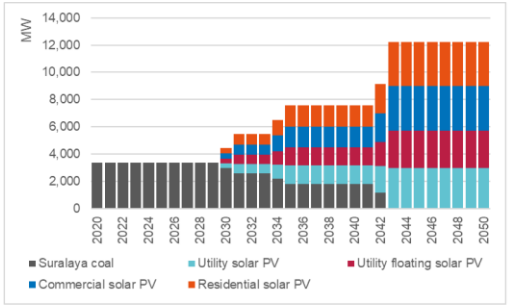


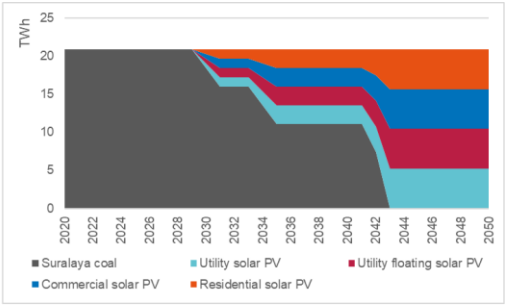
Scenarios: Suralaya continued operation

Ambition to Action

Baseline / Suralaya continued operation

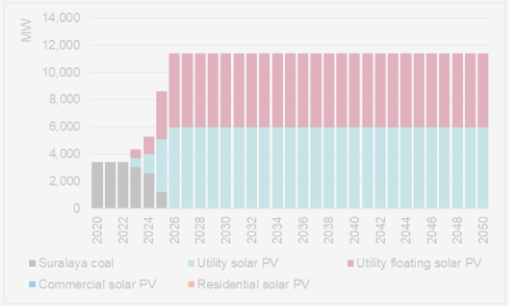
- 7 units at Suralaya (constructed 1984-1997) **continue operation for an assumed technical lifetime of 46 years** before retiring
- Solar PV introduced to make up for shortfall in output as units retire, so **total generation is ~21 TWh** in all years

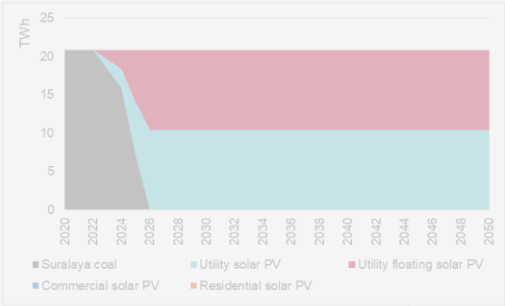




Affordable & reliable

- 7 units at Suralaya phased-out over four year period between 2022 and 2025, starting with the oldest units
- **Affordable and reliable:** Utility-scale solar PV introduced to make up for shortfall in output as units retire with half of generation gap met by land-based installations and half by floating solar PV





Inclusive & empowering

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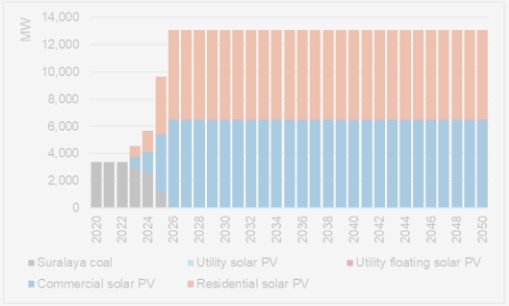

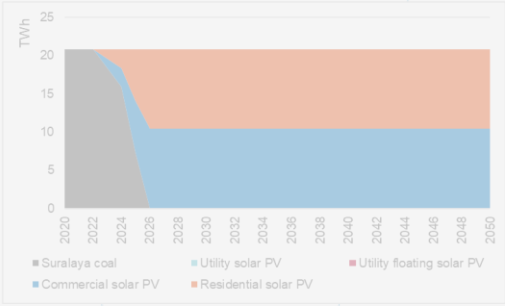

Scenarios: Affordable and reliable

Ambition to Action

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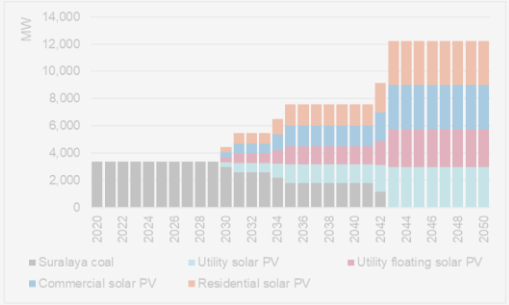

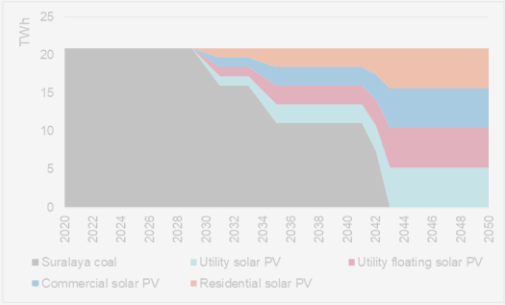

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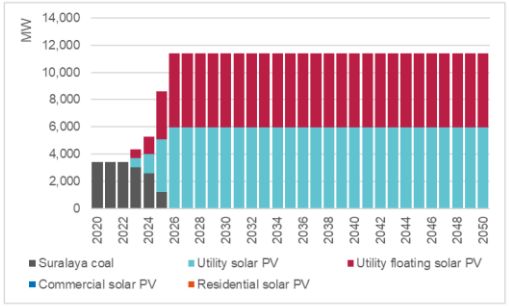

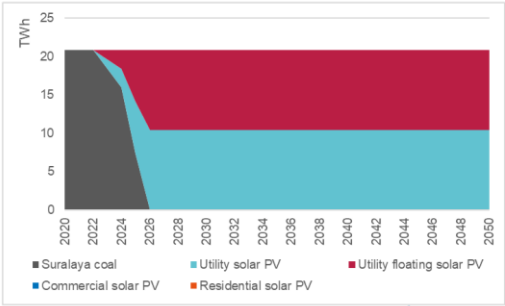

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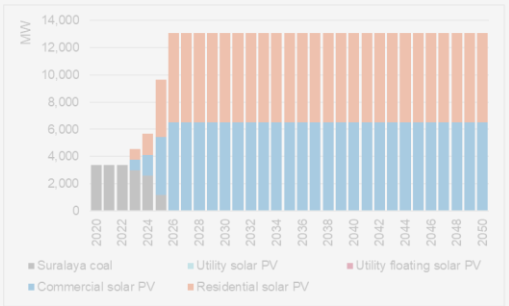

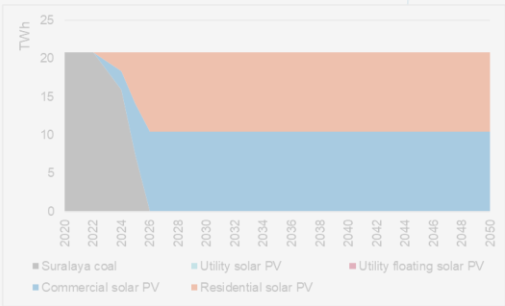

Scenarios: Inclusive and empowering

Ambition to Action

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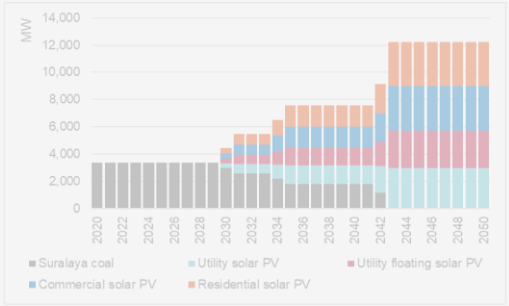

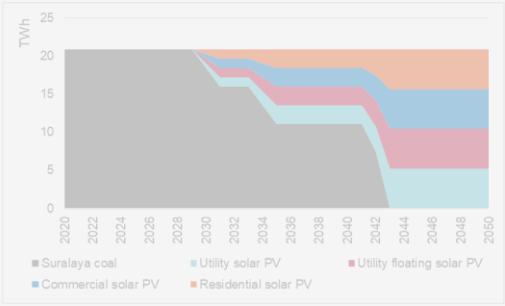

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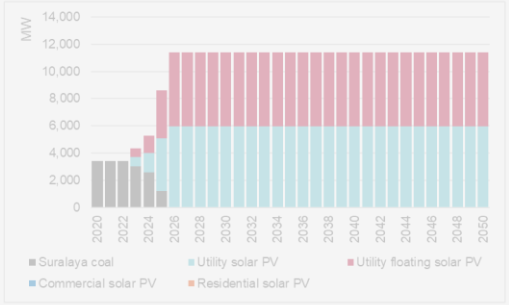

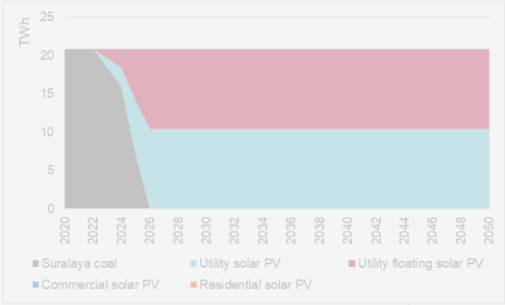

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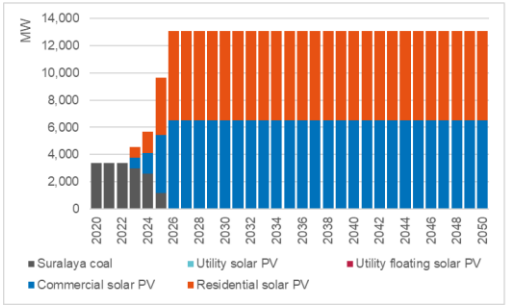

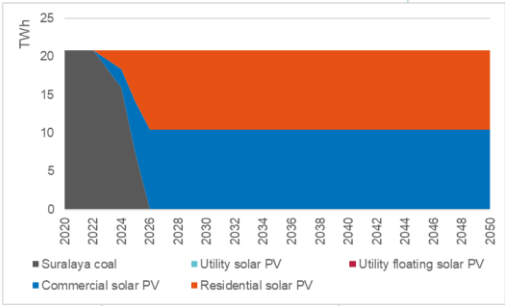

Scenarios: Overview of three scenarios

Ambition to Action

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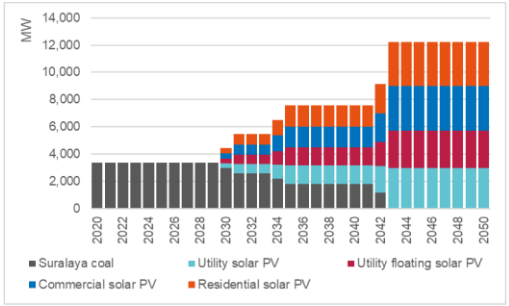

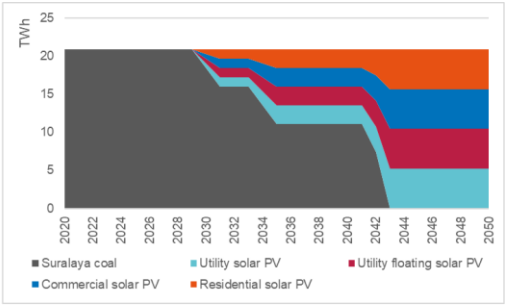

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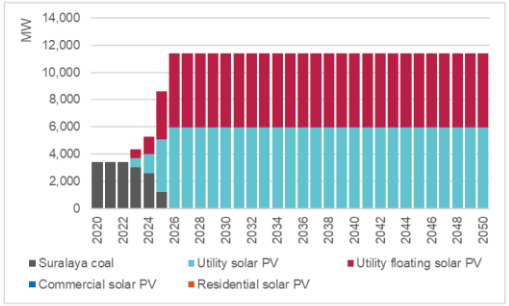

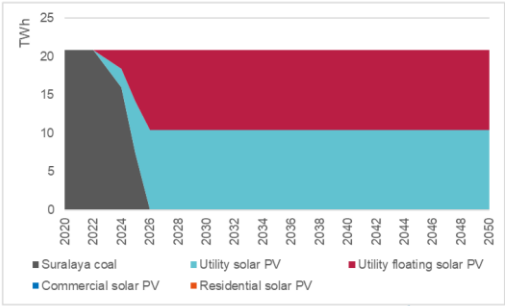

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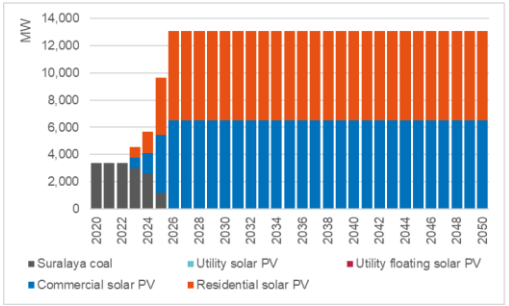

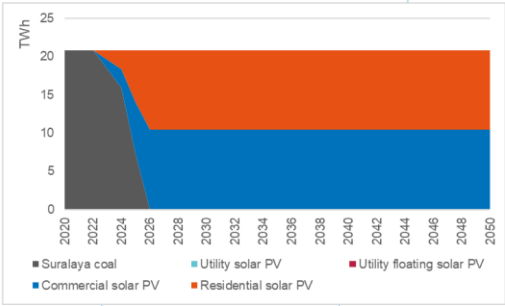

Initial results: Economic analysis

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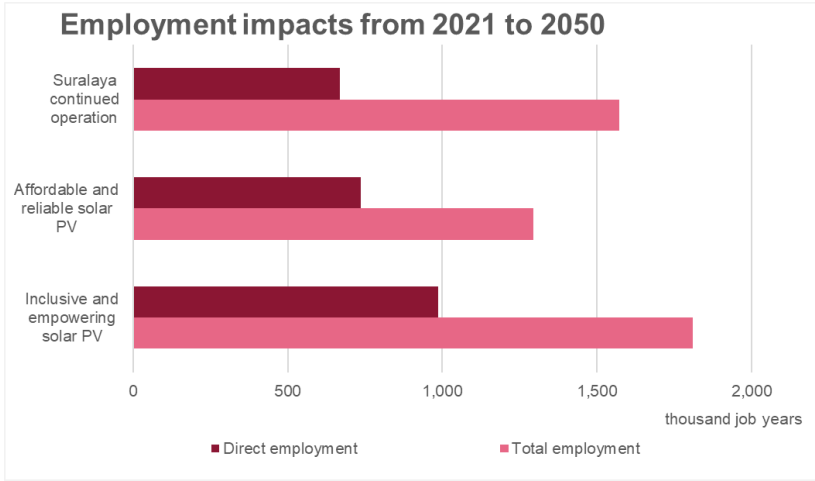
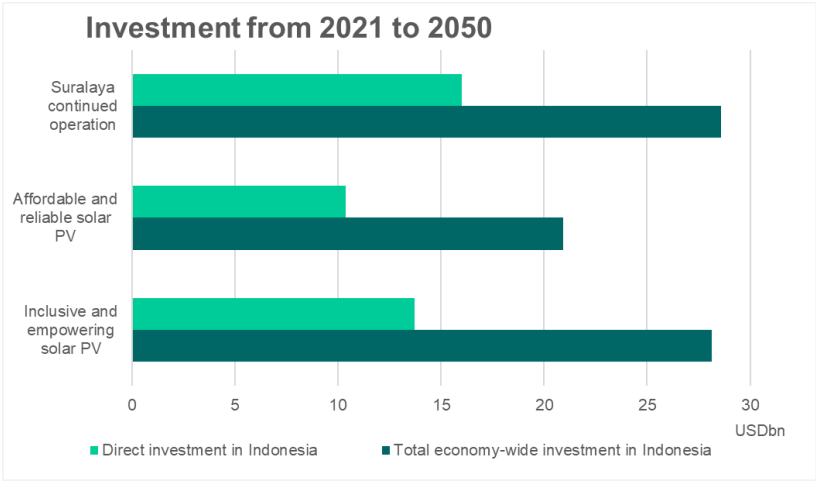
Economic analysis: headline impacts on jobs and investment





- Scenarios can support between **0.6-1.0 million *direct* job years and 1.3-1.8 million *total* job years** when considering the wider economic impacts throughout the Indonesian economy
- **Highest employment potential in the inclusive and empowering scenario**, correlated to investment cost requirements

- Delivering 21TWh of electricity supply over the period to 2050 may require on the order of **USD10-16 billion in *direct* investment**, depending on the scenario
- These investments trigger further domestic economic activity throughout the value chain and through spending of salaries, leading to **total domestic investments of USD 21-29 billion**

8 PEKERJAAN LAYAK DAN PERTUMBUHAN EKONOMI

Analysis based on scenario modelling in Economic Impact Model for Electricity Supply (EIM-ES): https://ambitiontoaction.net/methodologies-and-tools-eim/

Initial results: Employment (baseline)

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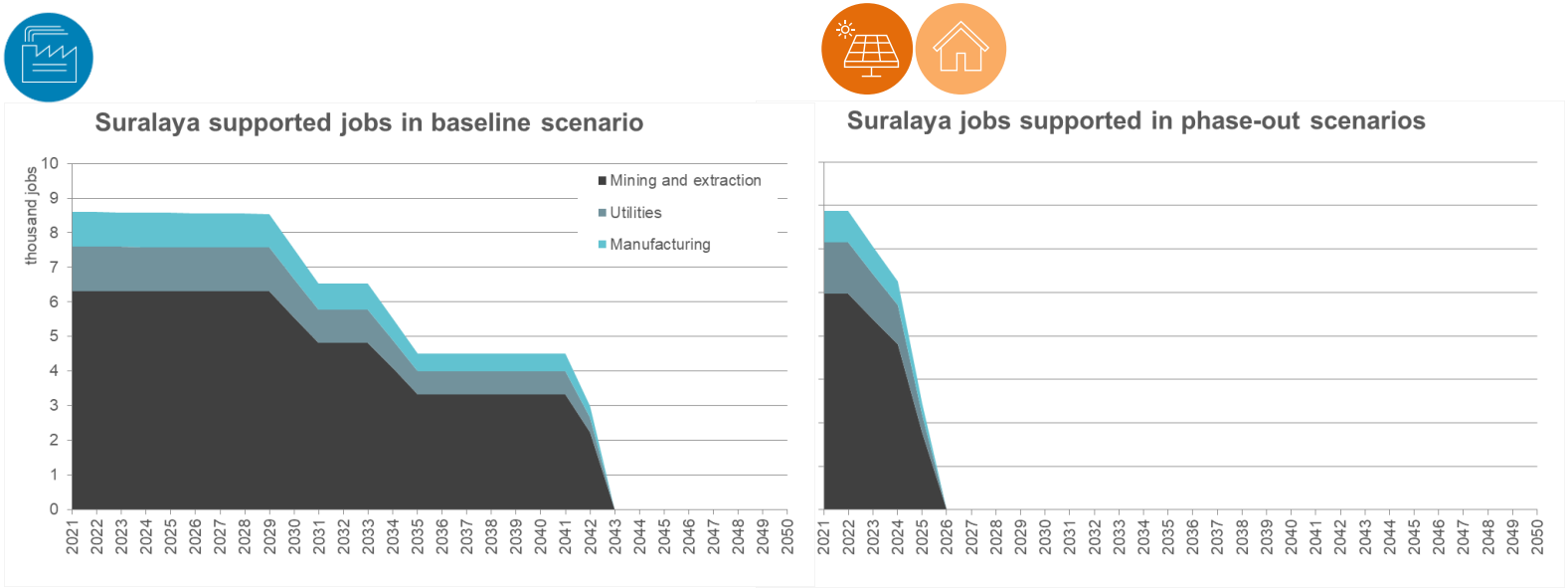
Economic analysis: focus on direct jobs at Suralaya



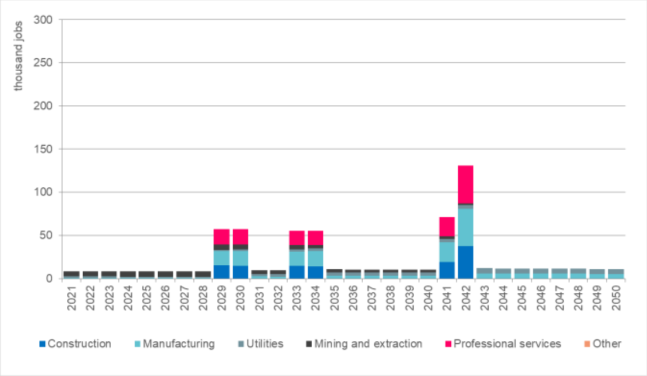
- Approximately 6,000 jobs currently supported in extraction and supply of fuel to Suralaya
- Further ~1,000 jobs supported in the operation of the units at the site and head office
- Plus ~1,000 jobs supported in the manufacturing and installation industries to maintain units, replace parts, etc.

8 PEKERJAAN LAYAK DAN PERTUMBUHAN EKONOMI

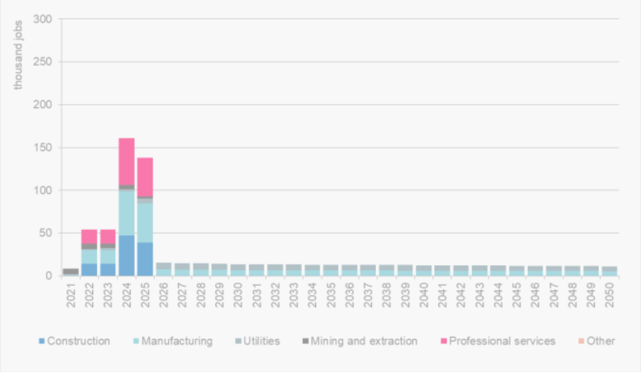
Analysis based on modelling of investment costs and salaries, calibrated to published employment figures for 2019

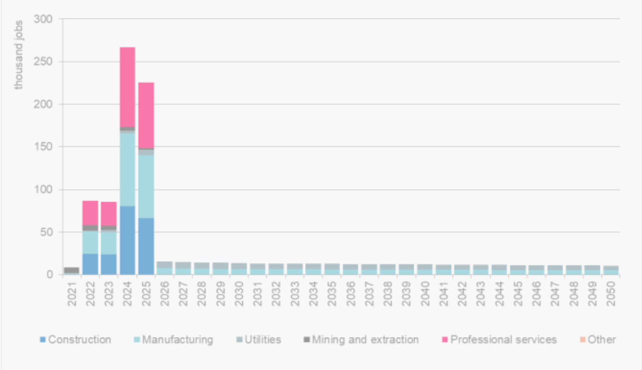
Initial results: Employment (baseline)

Economic analysis: direct jobs by sector over time



- Continued operation of Suralaya units **maintains a low level of jobs in fuel supply and plant operation** over the coming decades
- Pronounced spikes in jobs – **mainly in construction, manufacturing and professional service sectors** – occur from 2029 as new solar PV is built to make up the shortfall in generation from retiring coal units



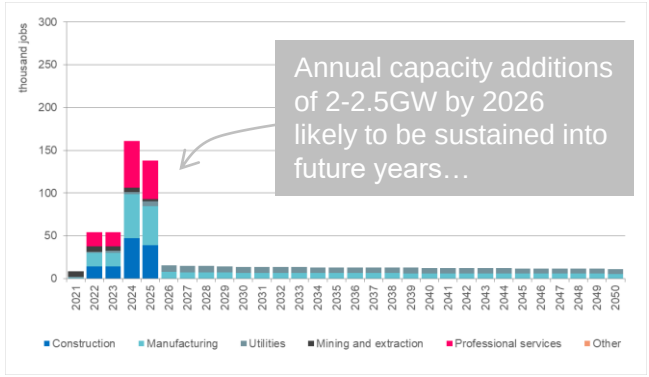


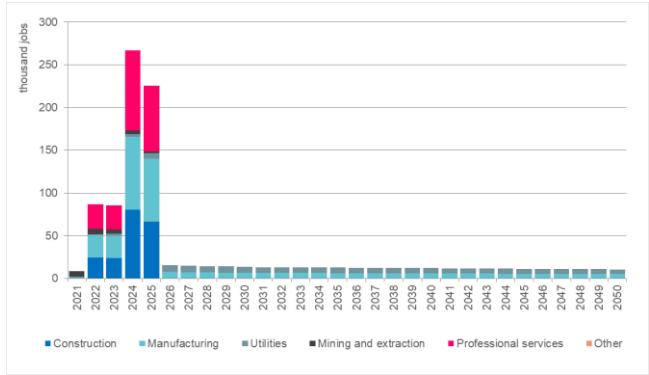
8 PEKERJAAN LAYAK DAN PERTUMBUHAN EKONOMI

Initial results: Employment (solar PV)

Ambition to Action

Economic analysis: direct jobs by sector over time





- Solar phase-in scenarios present significant employment opportunities – mainly in construction, manufacturing and professional service sectors – **reaching up to over 250,000 *direct* jobs a year and stimulating an additional equivalent order of magnitude of *indirect* and *induced* jobs in Indonesia**
- **Ambitious roll-out of new solar installations can stimulate employment (and wider economic) impacts in the short term** – given their relatively short planning and construction phases – which can offer important opportunities within the context of COVID19 recovery measures
- Scenarios offer a trajectory for **building the capacity and skills in the Indonesia workforce** to deploy increasing volumes of new solar PV capacity to meet growing electricity demand and the shortfall from continued phase-out of coal units in line with pathways consistent with its pledge to the Paris Agreement
- **Jobs in solar sector and associated supply chains are sustainable** as there will be a continued need for building at least as much new capacity each year over the medium-to-long term

8 PEKERJAAN LAYAK DAN PERTUMBUHAN EKONOMI

Initial results: Air pollution and health

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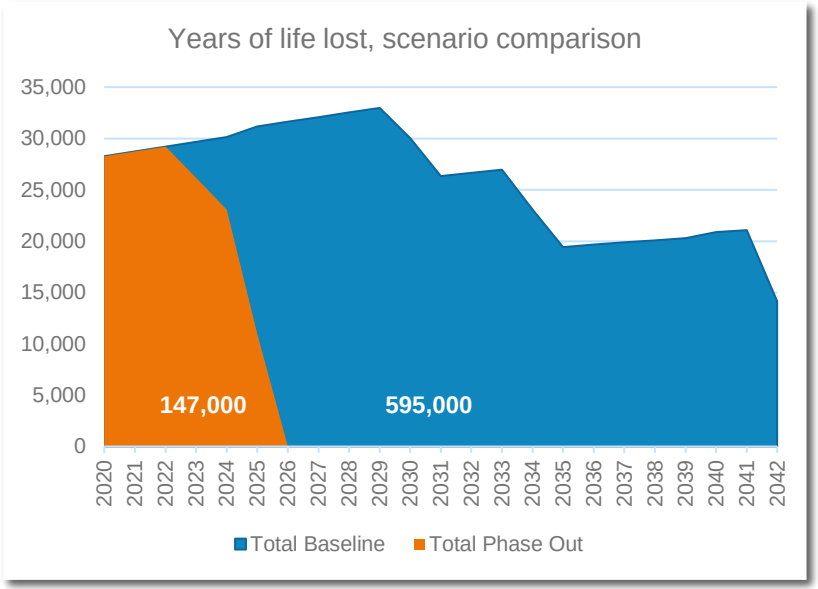
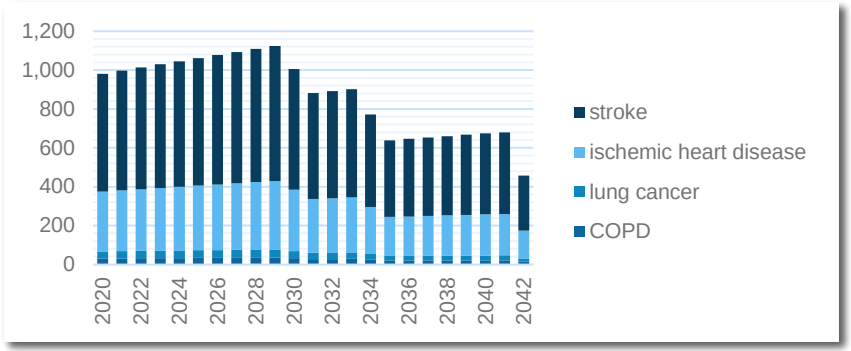
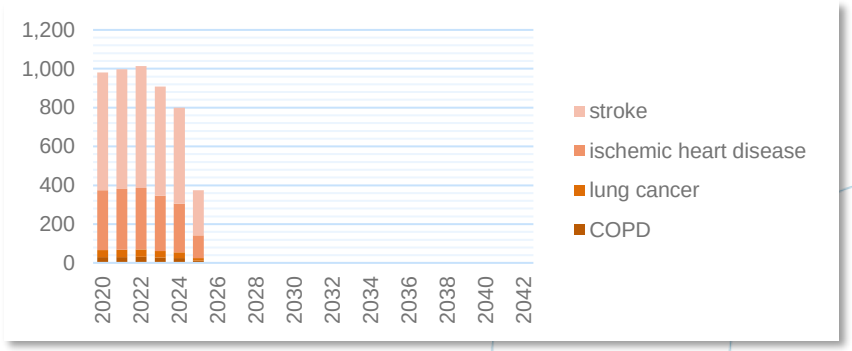
Air pollution health impacts



20,000 premature deaths



5,000 premature deaths



3 KEHIDUPAN SEHAT DAN SEJAHTERA

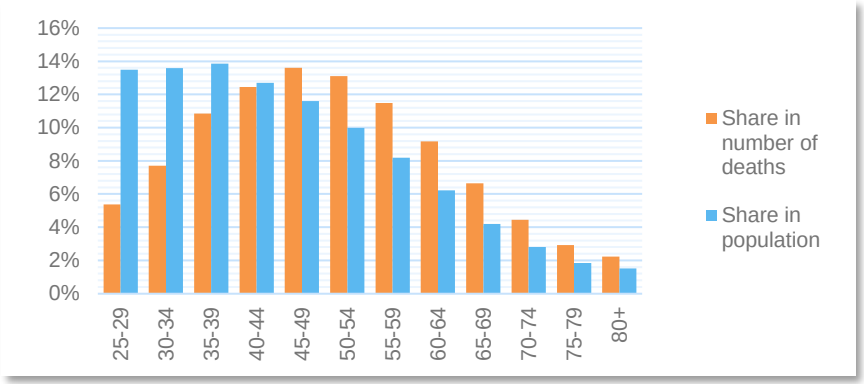
Analysis based on scenario modelling in Air Pollution Impact Model for Electricity Supply (AIRPOLIM-ES): https://ambitiontoaction.net/airpolim/

Initial results: Air pollution and health

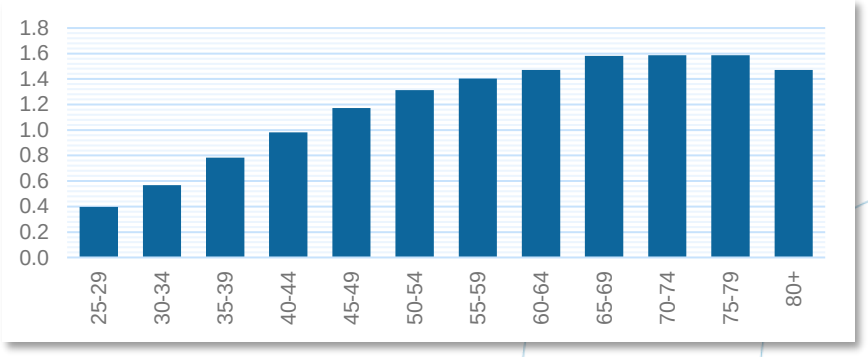
Ambition to Action

Air pollution health impacts

20,000 premature deaths, by age



20,000 deaths, proportional effect by age group



3 KEHIDUPAN SEHAT DAN SEJAHTERA

Initial results: Land-use requirements

Ambition to Action

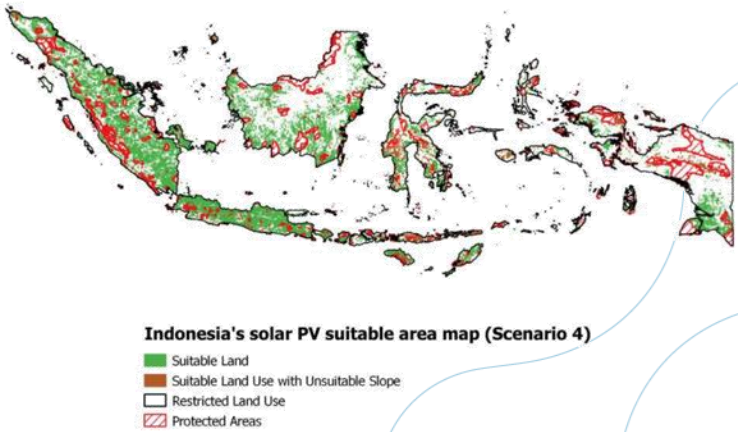
Land-use requirements for solar PV and Indonesian context

Source: IESR (2021)

Scenarios	Suitable area (km²) (% of Indonesia's total land mass)	Solar PV Technical Potential	
		Capacity (GWp)	Generation (TWh/year)
Scenario 1 (S1): Base exclusions (protected areas, forested areas, water bodies, wetland areas, airports and seaports) + slope exclusion (>10°)	484,455 (24.43%)	19,835	26,972
Scenario 2 (S2): S1 + agricultural lands (both pure and shrub-mixed) and plantation forest areas exclusions	187,806 (9.85%)	7,700	10,508
Scenario 3 (S3): S2 + transmigration and settlements areas exclusions	153,915 (8.07%)	6,310	8,541
Scenario 4 (S4): S2 + dry shrub exclusion	82,847 (4.34%)	3,397	4,705

Affordable and reliable

- Approximately **84 km²** land area required to install **6 GW** of ground mounted utility scale solar by **2026**
- Approximately **76 km²** water body area required to install **5.4 GW** of floating utility scale solar by **2026**



Analysis based on space requirement estimates for different types of solar PV installation in Technology Data for the Indonesian Power Sector, February 2021, p57-60

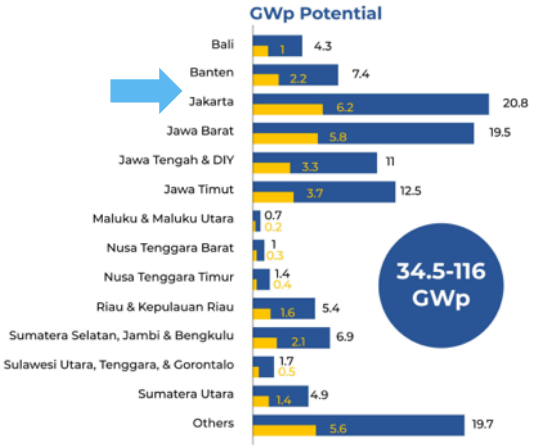
Initial results: Land-use requirements

Ambition to Action

Land-use requirements for solar PV and Indonesian context

Inclusive and empowering

- Approximately **65 km²** rooftop/building space required to install **6.5 GW** of commercial scale solar by **2026**
- Approximately **46 km²** rooftop space required to install **6.5 GW** of solar on residential housing by **2026**



Source: IESR (2021)

Table 3. Technical potential of rooftop solar in Indonesia based on 4 different scenarios

Province	Technical potential of rooftop solar in Indonesia, GWp			
	Scenario 1 – 24%	Scenario 2 – 60%	Scenario 3 – 81%	Scenario 4 – 33%
Jakarta	6.8	16.1	22.9	9.3
West Java	33.1	78.9	111.9	45.6
Central Java	32.5	77.3	109.6	44.6
Yogyakarta	3.7	8.9	12.6	5.1
East Java	34.7	82.6	117.2	47.7
Banten	8.6	20.5	29.1	11.9

Source: IESR (2020)

Analysis based on space requirement estimates for different types of solar PV installation in Technology Data for the Indonesian Power Sector, February 2021, p57-60

Discussion

How can you help?

Our analysis needs a strong Indonesian evidence base!

- What are realistic job-related numbers in Indonesia?
- How do we match jobs and skills?
- How we can use/present inclusiveness?
- What are politically attractive SDG priorities?

Analysis: summary of results

Focus Group Discussion October 21st, 2021

Ambition to Action

Overview of three scenarios

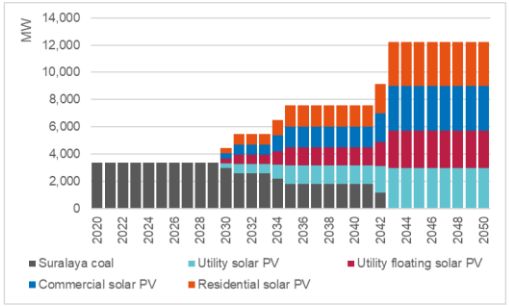
Ambition to Action

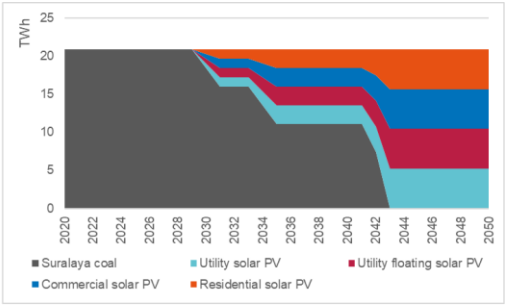
- 7 units at Suralaya (constructed 1984-1997) **continue operation for an assumed technical lifetime of 46 years** before retiring
- Solar PV introduced to make up for shortfall in output as units retire, so **total generation is ~21 TWh** in all years

- 7 units at Suralaya phased-out over four year period between 2022 and 2025, starting with the oldest units
- **Affordable and reliable:** Utility-scale solar PV introduced to make up for shortfall in output as units retire with half of generation gap met by land-based installations and half by floating solar PV

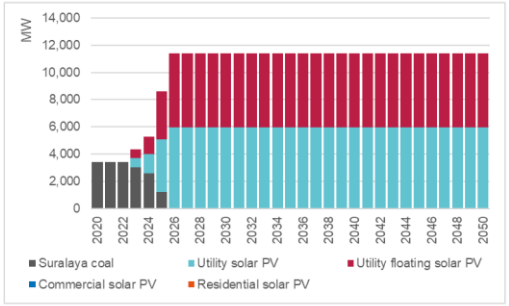
- Identical phase-out assumptions as affordable and reliable scenario
- **Inclusive and empowering:** Rooftop solar PV introduced to make up for shortfall in output with half of generation gap met by residential installations and half on commercial sites

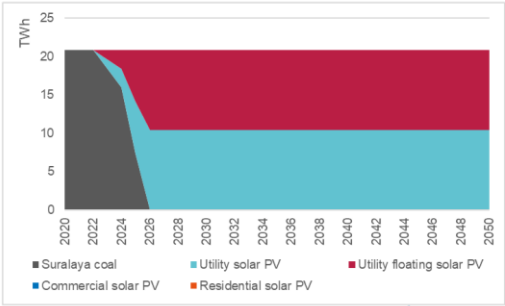
Baseline / Suralaya continued operation



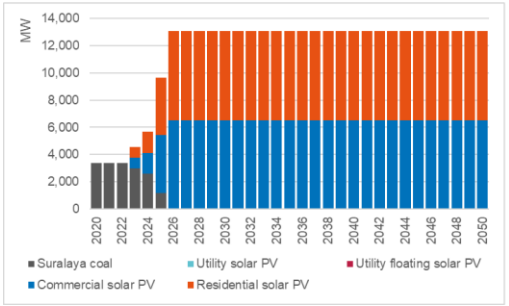


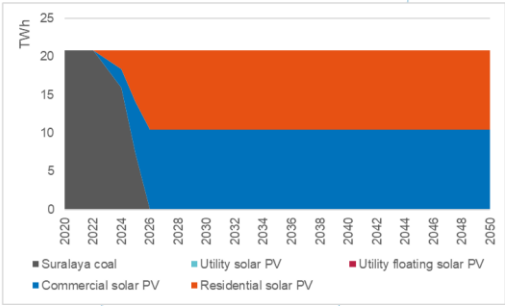
Affordable & reliable





Inclusive & empowering





What are the potential impacts?

Ambition to Action

Advances in SDGs and greater prosperity are within reach

Replacing the 3.4 GW Suralaya coal power plant with 10-15 GW of solar PV comes with substantial development benefits. This can be a driver for greater prosperity and an inclusive clean energy transition, but results are time-bound: the faster you replace, and the earlier you start, the larger the benefits.

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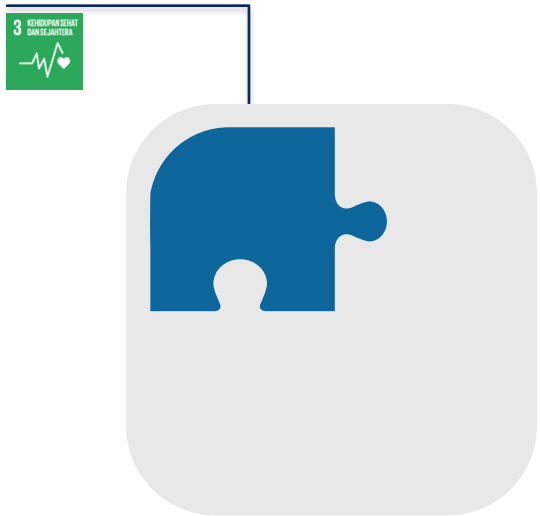
Health

15,000 premature deaths avoided

Located less then 100 km from Jakarta, the largest metropolitan area in SE Asia, Suralaya is especially polluting and exposes 30 mln people to unnecessary health risks. Early closure will prevent 450,000 ‘years life lost’.



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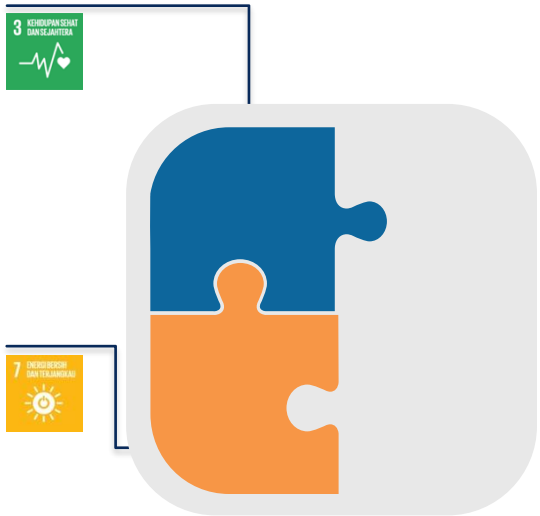

Energy
10-15 GW of competitive and clean capacity

Providing 21 TWh requires 10-15 GW of solar PV capacity. Utility-scale installations are notably cheaper than rooftop solar, with costs per kWh on par with (new) supercritical coal – even without carbon pricing.

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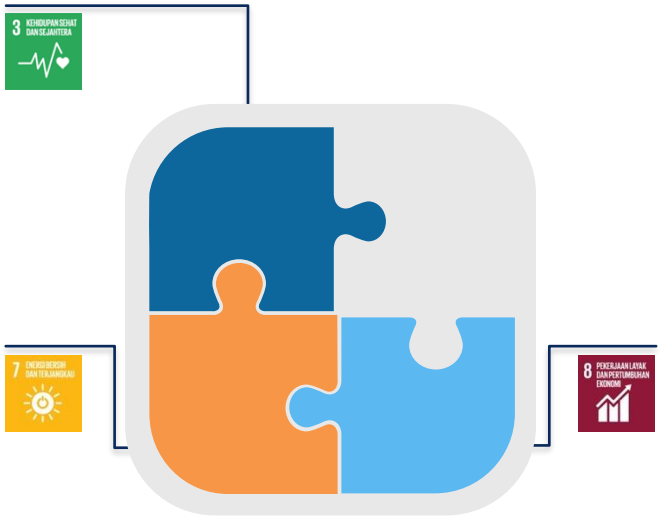

Investments and employment
Over 100,000 direct jobs and
USD 10-16 bn investments

Employment opportunities in construction, manufacturing and professional service sectors offer a trajectory for building future-proof capacity and skills in the Indonesian workforce, anticipating further coal plant phase-out to come.

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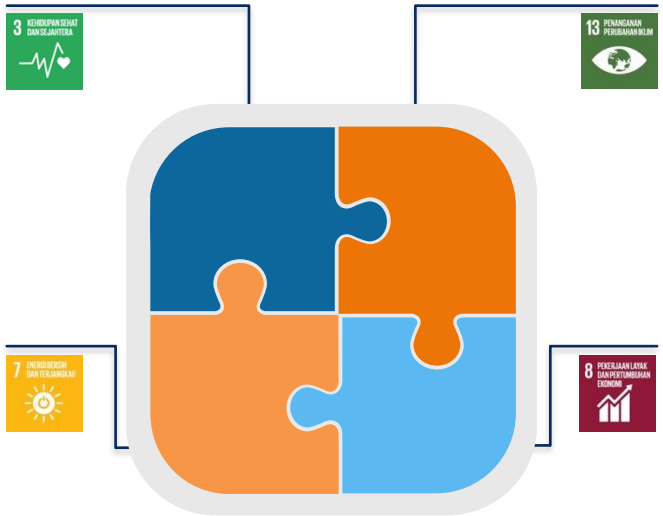

Climate action
270 Mt of GHG emissions avoided

The old coal plant is a major source of GHG emissions; Rapid phase-out can contribute 5-7% to NDC energy targets. For scale: 270 Mt is two years of total transport emissions in Indonesia.

Investments and employment
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How fast can this happen?

Ambition to Action

5 years is very fast but feasible if key barriers are overcome

Full replacement in 5 years would be very fast but feasible; a lack of concerted effort could delay this by 7-10 years. Some barriers are relatively easy to address, while others are more difficult to overcome. Key improvements are needed in spatial planning and streamlining of permitting, a predictable medium-term pathway for clean energy to replace fossil, and establishing stable policies to back large investments in capacity and manufacturing.

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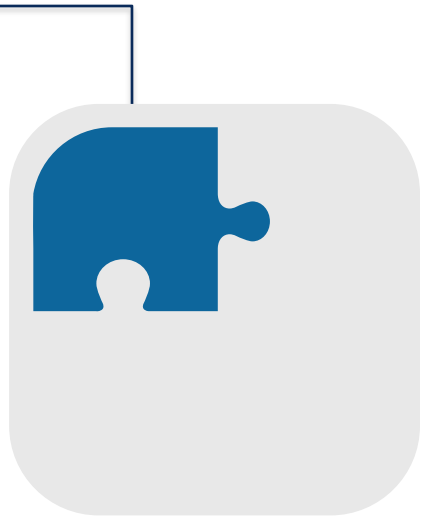
Location

Where can it be located?
How does it fit in the system?

Space requirements are massive with over 100 km2; land acquisition and permitting are slow processes. Integration of 10-15 GW into the grid takes some effort to organise, but is feasible even without need for (expensive) backup capacity.



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Market development

Where is equipment made?
Is skilled labour available?

Import is the default option, but domestic manufacturing of most components is feasible if medium-term prospects for sustained demand are good. Most labour can be provided locally with basic training.

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Capital, investments, and costs

What investments are needed?
How is the capital raised?

Access to capital is a major hurdle for a quick uptake of solar PV in Indonesia, but costs are not and solutions are within reach: project finance, ESCOs, and various policies to reduce developers' risks are indispensable in that regard.

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Users, sellers, and buyers

Who builds and operates?
Who uses and buys power?

Solar PV can really reach its full potential if PLN and ESDM take a step back and embrace a facilitating role, incentivising households, communities (e.g. BUMDes), businesses, and public institutions to take the initiative. Some changes are needed, but it doesn't require a major energy system reform.

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How to get there and what is next?

Ambition to Action

Collaboration, pragmatism, and enthusiasm can accelerate solar PV development

Government, PLN, and banks will have to move pro-actively, in coordination, and without delay, so that households and businesses can participate in the clean energy transition. Phasing-out fossil fuel use is inevitable and the sooner bold action is taken, the higher the domestic benefits can be.

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National and subnational government

Update KEN and create (sub)national solar strategies

Signal commitment to zero emissions energy system and create a predictable pathway with a realistic spatial plan. Let solar power targets and incentives do the work: for ministries, PLN, financial institutions, permitting authorities, industry, schools and universities, and local leaders.

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State-owned utility PLN

Prepare for leadership role in a clean energy future

Solar PV has much to offer in terms of a resilient and decentralised power system; Demand the right mandates, targets, and incentives to flourish in a world without fossil fuels, and facilitate Indonesians to participate in the energy transition – the earlier the better.

PLN

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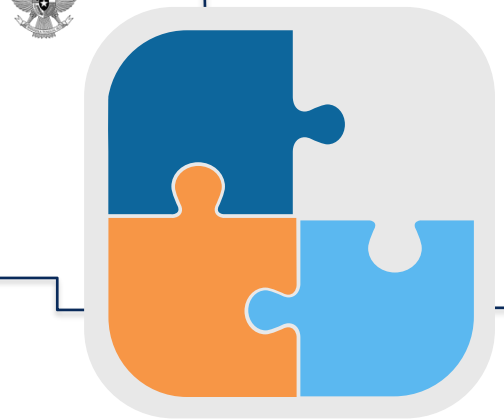

Financial institutions

Make financing the clean energy transition your concern

Express what is needed to enable project finance and set internal targets; seek dialogue and expertise on solar PV risk assessments; standardise products, engage with ESCOs, etc.

How to get there and what is next?

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Households & businesses

Participate in the clean energy transition

Community leaders: create awareness programmes, demonstration projects. Businesses: focus on technology cooperation, skills development, standardised package deals and one-stop-shop offers, and prepare for captive solar power and smart grid integration.

Financial institutions

Make financing the clean energy transition your concern

Express what is needed to enable project finance and set internal targets; seek dialogue and expertise on solar PV risk assessments; standardise products, engage with ESCOs, etc.

Discussion

How fast, how to get there, and what's next?

Ambition to Action

Agenda August 19th 2021

Section	Topics
Introduction Ambition to Action A2A team (10 minutes)	• Project introduction (Xander) • Suralaya as case study (Xander) • Energy transition and inclusiveness (Xander)
Analysis: Replacing Suralaya with Solar PV A2A team (45 minutes)	• Energy and climate impacts; SDG linkages (Xander) • Three scenarios (Harry) • Employment and other economic impacts (Harry) • Pollution, health, and land-use (Tessa)
Discussion: how can you help? All participants (45 minutes) Moderation Xander and Himsar	• We need a strong Indonesian evidence base (Himsar) • What are realistic job-related numbers in Indonesia? • How do we match jobs and skills? • How we can use/present inclusiveness, and SDG priorities?

Agenda October 21st 2021

Section	Topics
Introduction Ambition to Action Bappenas A2A team (10 minutes) (Xander)	• Project introduction • Suralaya as case study • Energy transition and inclusiveness
Analysis: Replacing Suralaya with Solar PV A2A team (45 minutes) (Xander)	• Three scenarios (Harry) • Energy and climate impacts; SDG linkages (Harry) • How fast? Barriers and enablers (Xander) • What's next? (Xander)
Discussion: how can you help? All participants (45 minutes) (moderation Himsar)	• Dialogues and learning from experiences abroad? • Topics for international technology cooperation and transfer? • Connections with national political priorities? • Ambitious climate policy and action

A2A Indonesia: Meet the team

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Tessa Schiefer
Climate Policy Analyst at NewClimate Institute

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Interviews

We are grateful to the organisations and individuals who participated in interviews to discuss and further strengthen our findings:

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