Bagaimana mengembangkan metodologi kegiatan aksi perubahan iklim

contoh kasus di skema JCM

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METODOLOGI AKSI PERUBAHAN IKLIM

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Kenapa harus ada metodologi?

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1. Dalam melakukan aksi perubahan iklim (kegiatan mitigasi dan adaptasi) diperlukan serangkaian prosedur dan tatacara untuk mendapatkan hasil yang diinginkan dan disepakati oleh semua pihak.
2. Metodologi membuat kegiatan yang dilakukan pada satu tempat mempunyai standar dan prosedur yang sama dengan yang dilakukan di tempat lain, sehingga hasilnya mempunyai derajat kepercayaan yang sama.
3. Dengan adanya metodologi, yang kemudian juga harus selalu ditingkatkan kualitasnya, maka kegiatan diharapkan akan lebih berlanjut.

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Untuk apa saja metodologi digunakan di dalam aksi perubahan iklim?

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1. Untuk melakukan riset.
2. Untuk melakukan perencanaan.
3. Untuk melakukan implementasi.
4. Untuk melakukan monitoring dan evaluasi.

Metodologi mencegah terjadinya implementasi kegiatan-kegiatan yang tidak bisa diukur hasil capaiannya, tidak jelas keberlanjutannya, dan tanpa adanya standar yang baku.

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Beberapa jenis metodologi mitigasi perubahan iklim

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Dalam kegiatan mitigasi perubahan iklim, **metodologi diciptakan untuk implementasi kegiatan berbasis pasar maupun non pasar**. Biasanya metodologi yang dibuat untuk kegiatan berbasis pasar lebih ketat dan detil dibandingkan yang non pasar.

Beberapa jenis metodologi mitigasi perubahan iklim:

Berbasis non-pasar:

Metodologi untuk kegiatan aksi mitigasi perubahan iklim nasional maupun daerah. Biasanya dibuat per negara, contoh: **Mexico yang membuat metodologi untuk pembangunan rumah hemat energi**.

Berbasis pasar:

a. Metodologi CDM.
b. Metodologi JCM.
c. Metodologi VCS.
d. Metodologi Gold Standard.
e. Metodologi Plan Vivo.

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Metodologi CDM, salah satu metodologi mitigasi yang paling kompleks

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Saat ini metodologi CDM adalah metodologi yang paling banyak dibuat di dunia. Lebih dari 300 metodologi telah disetujui oleh CDM Executive Board untuk bisa digunakan. Metodologi ini banyak menjadi acuan bagi kegiatan atau skema lain.

Walau begitu, metodologi di dalam CDM banyak sekali dikeluhkan oleh para penggunanya karena biasanya **terlalu ketat, terlalu detil, harus menggunakan standar internasional, dan terlalu kaku di dalam MRV nya, sehingga sering susah untuk diimplementasikan**. Beberapa metodologi, seperti metodologi CCS (Carbon Captured and Storage), dibuat dan disetujui dalam waktu 4 tahun oleh tidak kurang dari 50 negara.

Beberapa istilah di dalam metodologi CDM adalah: **AM** - Approved Methodology, **ACM** - Approved Consolidated Methodology, **AMS** - Approved Methodology for Small Scale Projects, dan **ARAM** - Aforestation and Reforestation Approved Methodologies.

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Jenis lingkup sektor metodologi CDM

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Ada 15 jenis sub sektor di dalam CDM yang dikembangkan metodologinya:

1. Energy industries (RE and non RE)
2. Energy distribution
3. Energy demand
4. Manufacturing industries
5. Chemical industries
6. Construction
7. Transport
8. Mining/mineral production
9. Metal production
10. Fugitive emission from fuel
11. Fugitive emission from production and consumption of halocarbon
12. Solvent use
13. Waste handling and disposal
14. Afforestation and reforestation
15. Agriculture

Metodologi CDM banyak yang menjadi acuan dari pembuatan metodologi skema lain, seperti VCS, JCM, Goldstandard, Planvivo

Metodologi biasanya disederhanakan dan disesuaikan dengan keperluan

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Contoh sub sektor manufacturing industries

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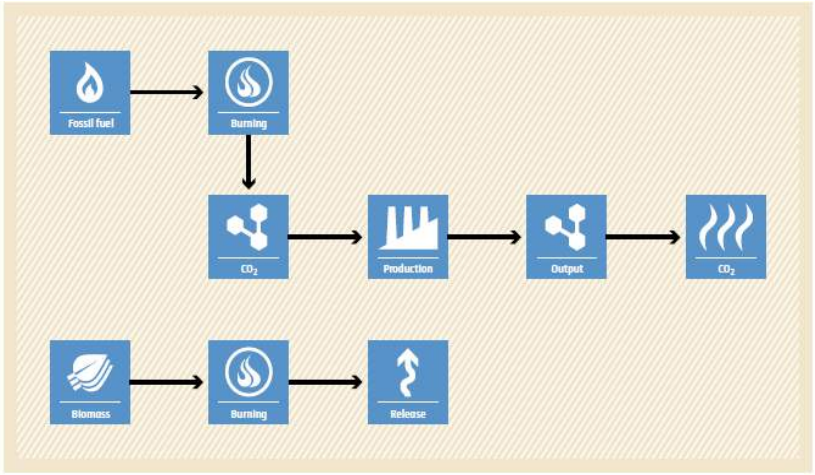
Sectoral scope	Renewable energy	Energy Efficiency	GHG destruction	GHG emission avoidance	Fuel/Feedstock Switch	GHG removal by sinks	Displacement of a more-GHG-intensive output
4 Manufacturing industries	AM0007	AM0049	AM0078	ACM0005	AM0049		AM0070
	AM0036	AM0055	AM0096	ACM0021	AM0092		AM0095
	ACM0003	AM0070	AM0111	AM0057	ACM0003		AM0114
	AMS-III.Z.	AM0106	AMS-III.K.	AM0065	ACM0005		AM0115
	AMS-III.AS.	AM0109		AM0092	ACM0009		ACM0012
	AMS-III.BG.	AM0114		AMS-III.L.	ACM0015		
		AM0115			AMS-III.N.		
		ACM0012			AMS-III.Z.		
		AMS-II.D.			AMS-III.AD.		
		AMS-II.H.			AMS-III.AM.		
		AMS-II.I.			AMS-III.AS.		
		AMS-III.P.					
		AMS-III.Q.					
		AMS-III.V.					
		AMS-III.Z.					
		AMS-III.AS.					
		AMS-III.BD.					
		AMS-III.BG.					

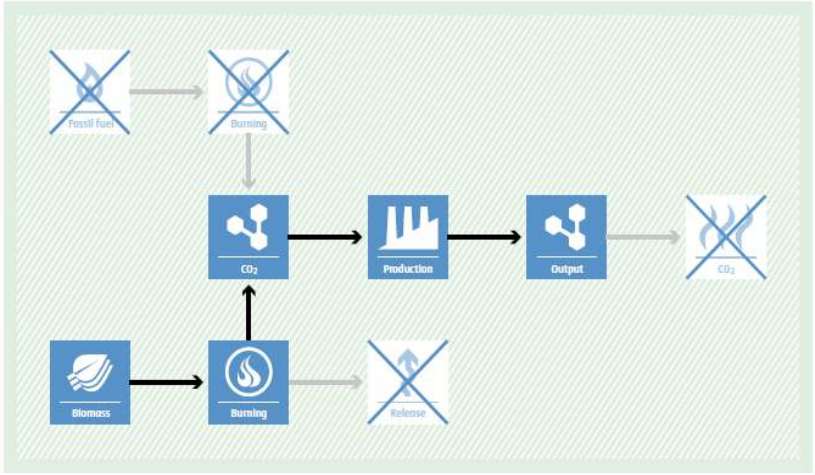
Contoh metodologi CDM untuk energi

Substitution of CO_2 from fossil or mineral origin by CO_2 from renewable sources in the production of inorganic compounds

BASELINE SCENARIO
Fossil or mineral sources are the source of CO_2 for the production of inorganic compounds.



PROJECT SCENARIO
Renewable sources of CO_2 are the source of CO_2 for the production of inorganic compounds.



- The CO2 from the renewable source was already produced and is not diverted from another application;
- CO2 from fossil or mineral sources used for the production of inorganic compounds in the baseline is from a production process whose only useful output is CO2 and will not be emitted to the atmosphere in the project scenario. The CO2 production process from fossil source does not produce any energy by-product;
- No additional significant energy quantities are required to prepare the renewable CO2 for use in the project.

Monitored:

- Amount of inorganic compound produced;
- Carbon content and molecular weight of the inorganic compound;
- Amounts of non-renewable and renewable CO2 used for the production of inorganic compounds.

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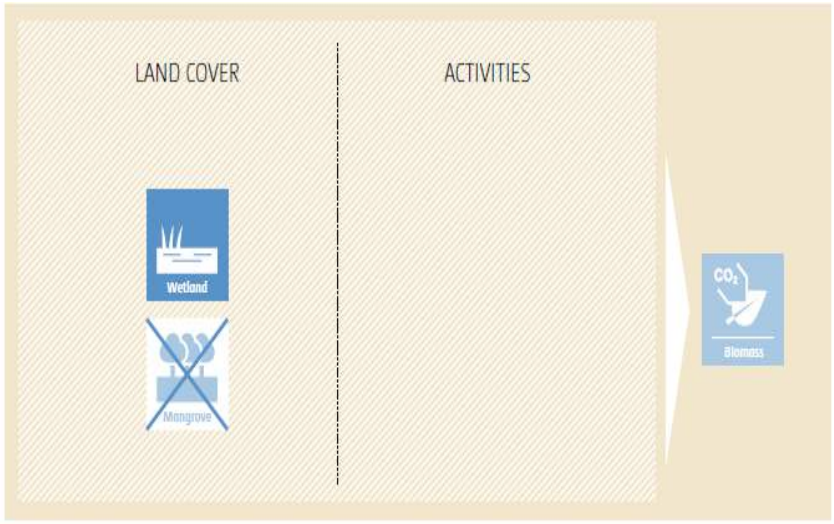
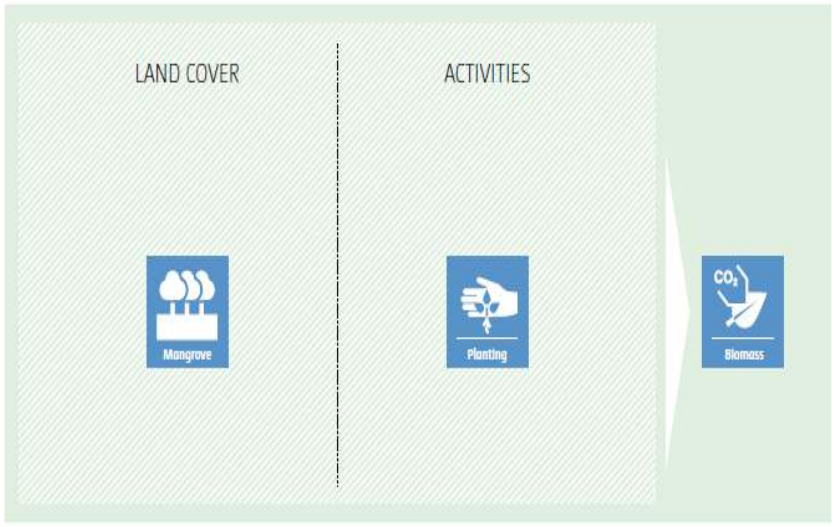
Contoh metodologi CDM kehutanan

Afforestation and reforestation of degraded mangrove habitats

BASELINE SCENARIO
Mangrove habitat (wetland) is degraded but may contain a few mangrove trees of very poor quality, some signs of human activities are visible, e.g. fuel wood collection.



PROJECT SCENARIO
Mangrove forests are standing on lands.



- The land subject to the project activity is degraded mangrove habitat;
- More than 90 % of the project area is planted with mangrove species. If more than 10 % of the project area is planted with non-mangrove species then the project activity does not lead to alteration of hydrology of the project area and hydrology of connected up-gradient and down-gradient wetland area;
- Soil disturbance attributable to the A/R CDM project activity does not cover more than 10 % of area.

At validation:

- Tree diameter increments, allometric equations or biomass expansion factors, rootshoot ratios and basic wood densities;
- Pre-project crown cover of trees and shrubs.

Monitored:

- Area forested, stratum-wise areas, area of sample plots;
- Diameter, and possibly height, of trees in sample plots;
- Optionally: Diameters of pieces of dead wood, shrub crown cover by strata; area under agricultural activities displaced by the project activity, area subjected to burning of biomass for site preparation and clearing of harvest residue; area affected by forest fires.

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MEMBANGUN METODOLOGI AKSI PERUBAHAN IKLIM DENGAN CONTOH KASUS SKEMA JCM

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Konsep dasar JCM

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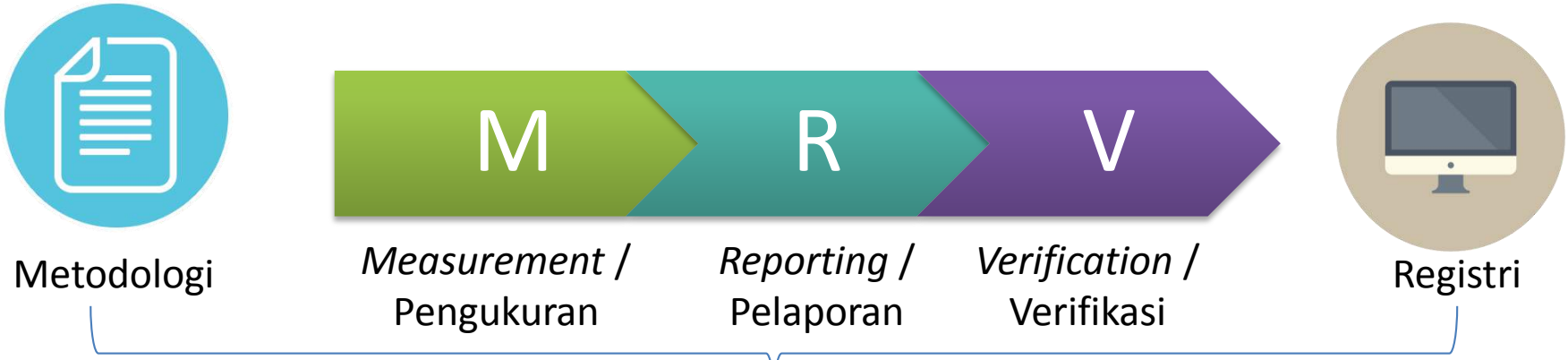
Posisi metodologi di dalam siklus proyek

Bagaimana melakukan MRV ditetapkan di dalam metodologi proyek



Hal – hal yang dibutuhkan untuk memastikan penurunan emisi

MRV memastikan agar penurunan emisi benar-benar terjadi dan 1 tCO_2 adalah benar-benar 1 tCO_2

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Siklus proyek JCM

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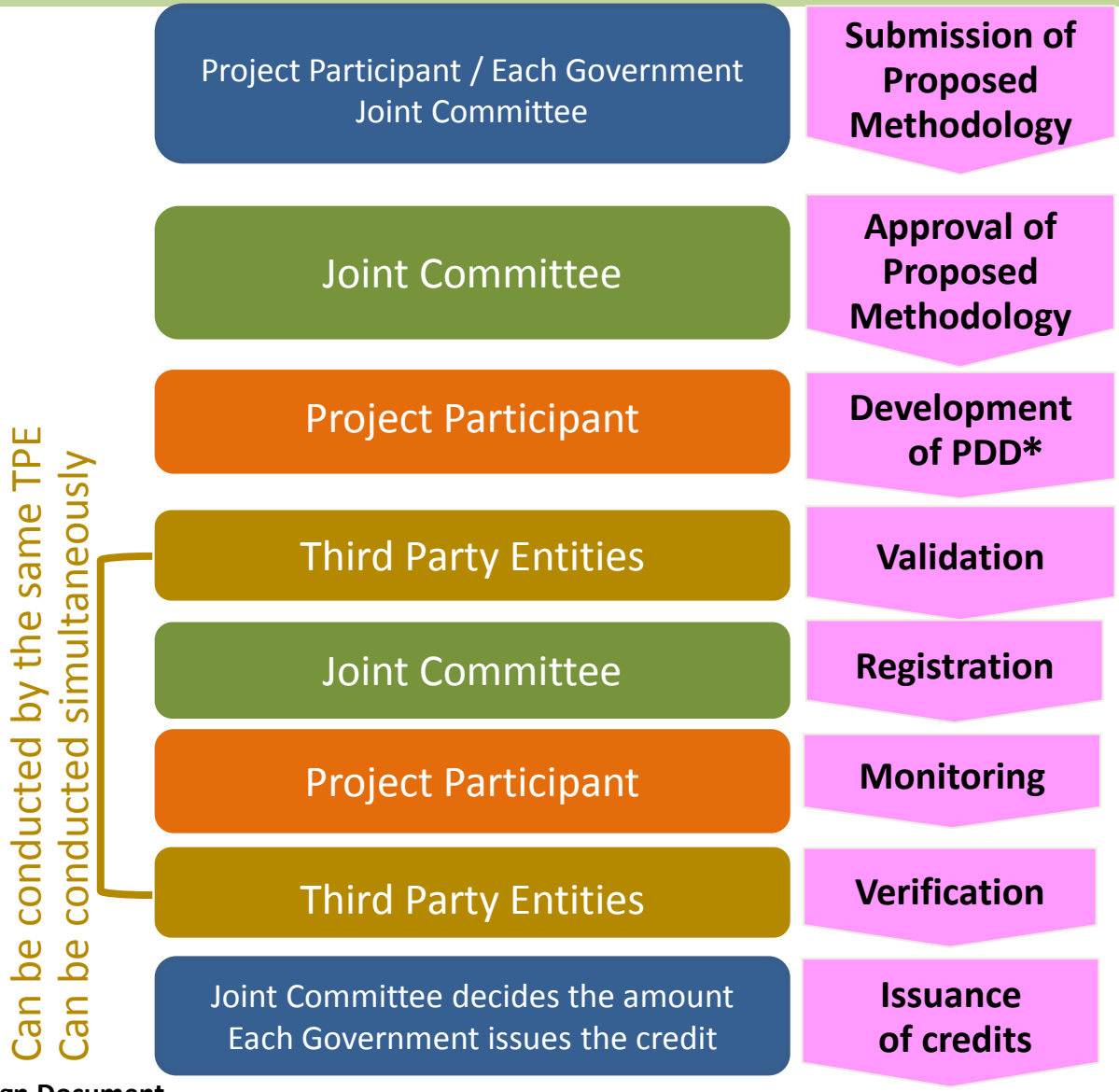

*PDD: Project Design Document

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Infrastruktur skema JCM Indonesia

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Guideline:

1. **Project Design Document**
2. **Proposed Methodology**
3. **Third Party Entity**
4. **Validation and Verification**
5. **Sustainable Development Implementation Plan and Report (Indonesia's specific JCM guidelines)**

Rules: 1. Rules of Implementation
2. Rules of Procedure for JC

Procedure: Project Cycle Procedure

Methodologies:
15 methodologi untuk efisiensi energy dan energy terbarukan telah dikembangkan

ISO 14065 based

Registry system

Registry sistem dikembangkan dengan system offline registry

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Apakah fungsi metodologi di dalam skema JCM?

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- Metodologi JCM adalah seperangkat dokumen teknis yang dirancang untuk menentukan:
  - kriteria kelayakan proyek,
  - metode monitoring,
  - metode pengukuran penurunan emisi sebuah proyek JCM

- Metodologi proyek JCM didesain berdasarkan teknologi yang digunakan, sehingga **sebuah metodologi dapat digunakan untuk lebih dari satu proyek yang menggunakan teknologi yang sama**.

- Dengan menggunakan metodologi yang sama, maka proyek atau kegiatan yang menggunakan teknologi yang sama di tempat berbeda akan dapat dihitung dengan metode perhitungan yang sama sehingga lebih bisa dipertanggungjawabkan secara ilmiah.

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Pertimbangan utama dari pengembangan metodologi JCM di Indonesia

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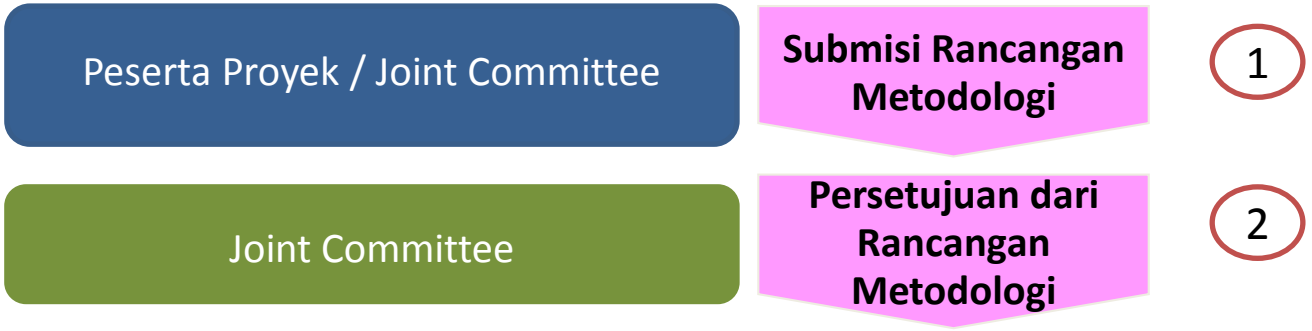
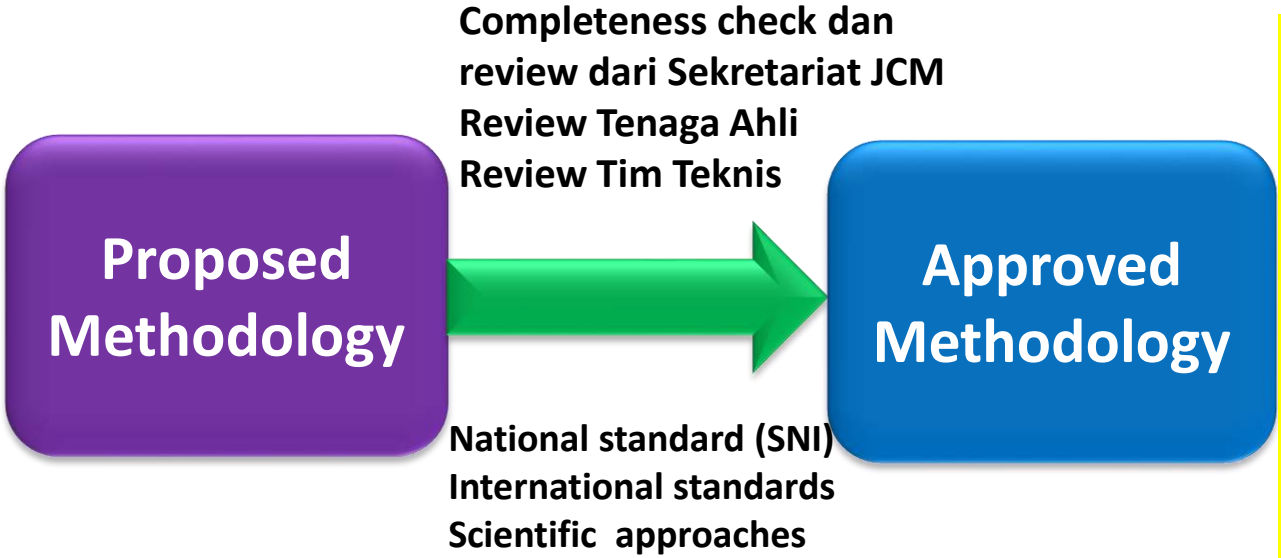
Aspect	Examples
Technical	✓ Conservativeness of reference emission (case-by-case) ✓ Reference to available standards for default values and regulations [SNI (Indonesian National Standard), ISO, and JIS (Japanese standard)] ✓ Scientific principles and references
Reference data source	✓ Consideration of Indonesian circumstances: • The level of technology widely used in Indonesia • Interviews with relevant resource persons • Collection of real data and field survey ✓ Source of available data (IPCC, national data, public data)
Compliance	✓ Compliance to international and national regulations (e.g. control of refrigerants, hazardous materials) ✓ Compliance to JCM agreed rules, guidelines, and principles
Relevance	✓ Applicability to real project situation ✓ Use of various energy sources at project locations ✓ Improvement from 'business as usual'
Ease of understanding	✓ Use of simplified diagram ✓ Simplified language
Consistency	Terms and reference used consistent with other methodologies applied in Indonesia

Siapa yang membuat metodologi?



- Metodologi JCM ditetapkan oleh *Joint Committee* berdasarkan usulan sendiri maupun berdasarkan masukan dari pihak lain, termasuk peserta proyek.
- Review usulan metodologi melibatkan Pemerintah, tenaga ahli, asesmen lapangan, dan komentar publik.
- Tanpa penggunaan metodologi yang telah disetujui, pengukuran penurunan emisi suatu proyek tidak dapat disetujui.

Contoh dari transparansi dan akuntabiliti untuk pembuatan metodologi JCM



- Sistem MRV dari model dan dasar scientificnya sampai teknik pengukuran harus dijelaskan di dalam metodologi JCM.
- Pembangunan metodologi adalah berdasar jenis teknologi dan bukan jenis proyek. Contohnya untuk tenaga surya yang memiliki beberapa mtodologi.
- Sekretariat JCM Indonesia menerima proposal metodologi dari partisipan proyek dan kemudian melakukan review (oleh Sekretariat JCM dan tim ahli). Metodologi yeng telah direview kemudian akan direview lagi dan didiskusikan lagi di dalam pertemuan JC meeting.

- Setiap metodologi harus sesuai dengan Standar Nasional Indonesia/SNI.
- Apabila belum ada SNI nya, maka diperbolehkan menggunakan standar internasional atau pendekatan.
- Contoh dari penggunaan SNI adalah SNI 16-7062-2004: pengukuran standar penerangan di bidang kerja yang kemudian dipergunakan sebagai dasar metodologi “Installation of LED lighting for grocery store”.
- Faktor emisi Indonesia yang kemudian menjadi acuan untuk model perhitungan metodologi.

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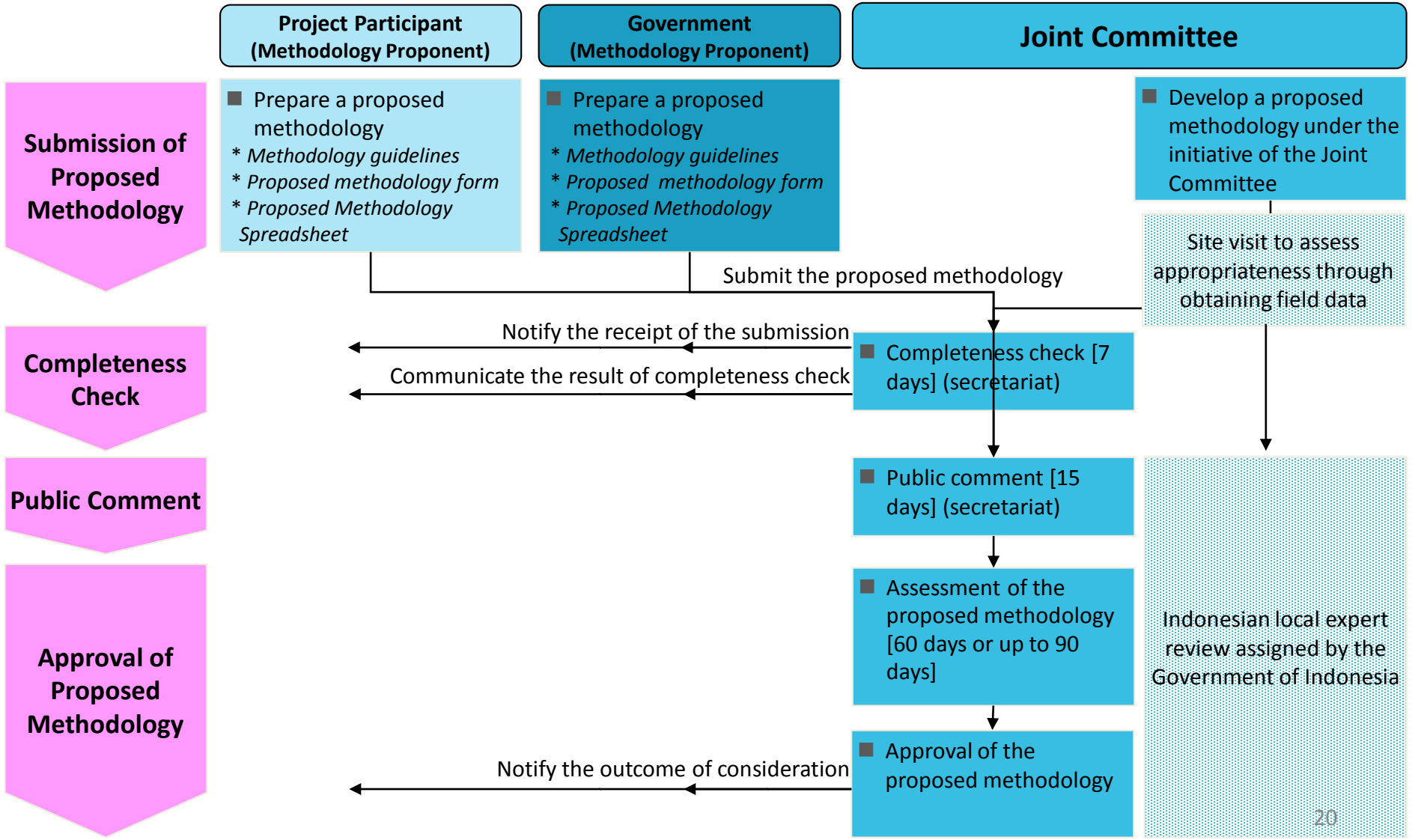
Langkah pembuatan metodologi JCM



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Outline dari metodologi JCM

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1. Proposed Methodology Form

Cover sheet of the Proposed Methodology Form

A. Title of the methodology
B. Terms and definitions
C. Summary of the methodology
D. Eligibility criteria
E. Emission Sources and GHG types
F. Establishment and calculation of reference emissions
   - F.1. Establishment of reference emissions
   - F.2. Calculation of reference emissions
G. Calculation of project emissions
H. Calculation of emissions reductions
I. Data and parameters fixed *ex ante*

2. Proposed methodology spreadsheet (Input sheet)

Table 1: Parameters to be monitored ex post

Table 2: Project-specific parameters to be fixed *ex ante*

Table3: Ex-ante estimation of CO2 emission reductions

3. Proposed methodology spreadsheet (Calculation Process Sheet)

1. Calculations for emission reductions
2. Selected default values, etc.
3. Calculations for reference emissions
4. Calculations of the project emissions

List of default values

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Prinsip penurunan emisi dalam JCM

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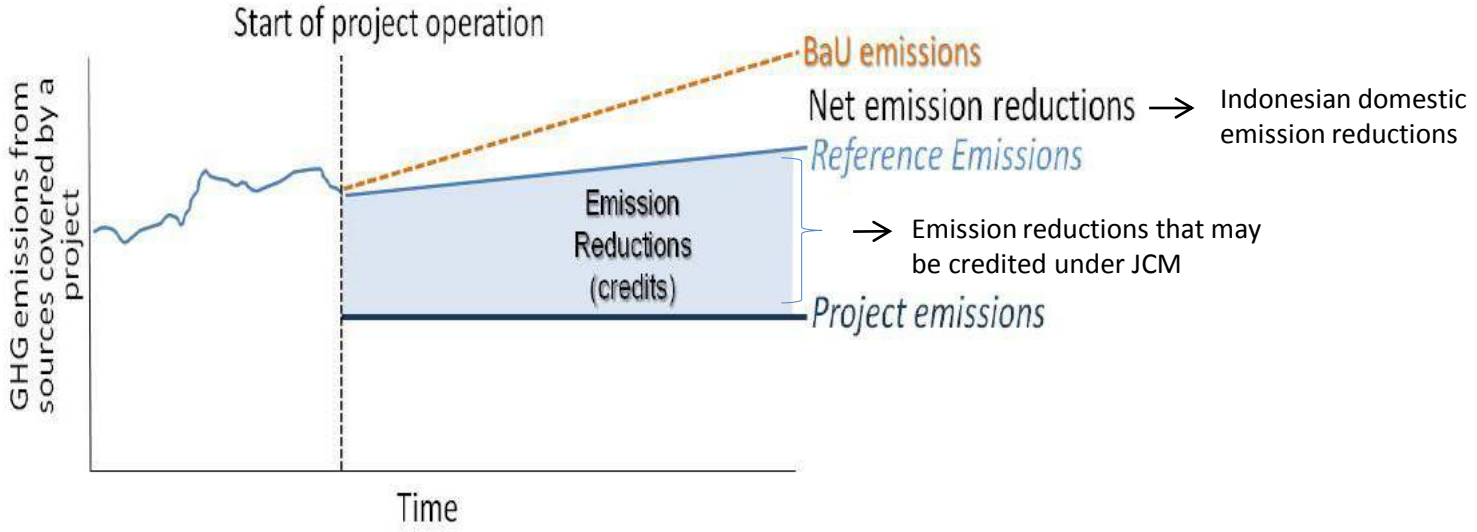
Emission reductions = reference emissions – project emissions

- *Reference emissions:* tingkat emisi yang besarnya kurang dari emisi *business-as-usual (BaU),* yaitu emisi yang diperkirakan akan dihasilkan dari kegiatan dengan *output* yang setara dengan proyek JCM yang diusulkan.
- *Reference Emissions* nilainya bisa sama ataupun berbeda dengan emisi baseline, tergantung metodologi yang digunakan.
- Pendekatan ini dilakukan untuk memperoleh *net decrease and/or avoidance* dari emisi GRK.



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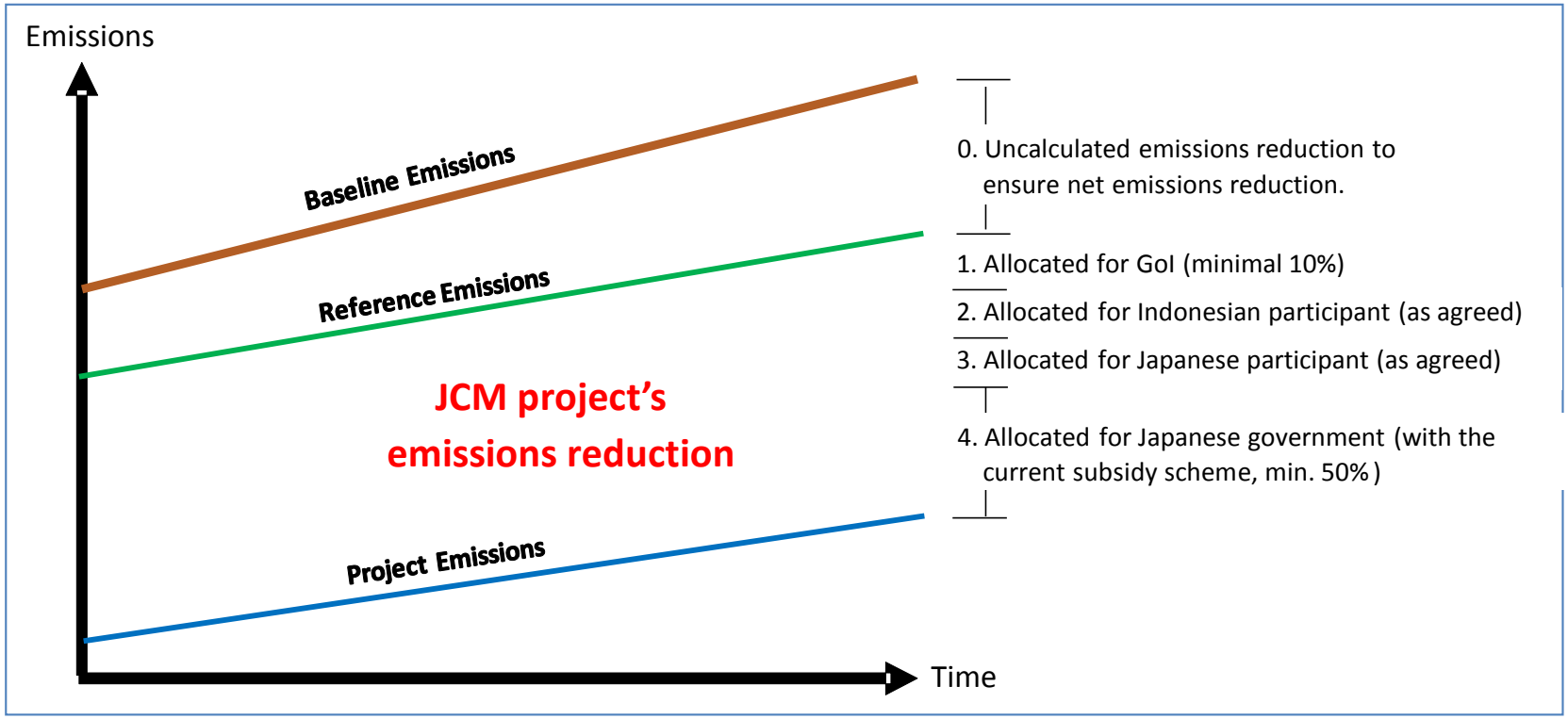
Metode perhitungan penurunan emisi JCM



0: Net emissions reduction
1: National emissions reduction
2: National emissions reduction
3: Internationally transferred mitigation outcomes (ITMOs)
4: Internationally transferred mitigation outcomes (ITMOs)5:

Net emission reduction belum ada kalkulasinya di dalam metodologi JCM, jadi harus dihitung secara terpisah. Secara langsung ini dapat dilaporkan sebagai capaian Indonesia.

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Setting dari reference emissions di dalam metodologi JCM

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Methodology No.	Methodology Title	Version No.	Reference Emissions' Key Factor	BAU Emissions' Key Factor
ID_AM001	Power Generation by Waste Heat Recovery in Cement Industry	01.0	The amount of electricity imported from the grid equal to WHRG net capacity.	The amount of electricity imported from the grid equal to WHRG capacity.
ID_AM002	Energy Saving by Introduction of High Efficiency Centrifugal Chiller	02.0	COP value of chillers with high market share determined by market survey.	COP value of existing old type chillers (assumed as approx. 5.0).
ID_AM003	Installation of Energy-efficient Refrigerators Using Natural Refrigerant at Food Industry Cold Storage and Frozen Food Processing Plant	02.0	COP value of reference refrigerators (for cold storage: 1.71; for individual quick freezer: 1.32).	COP value of refrigerators with high market share (for cold storage: 1.6-1.65; for individual quick freezer: 1.2-1.25).
ID_AM004	Installation of Inverter-Type Air Conditioning System for Cooling for Grocery Store	02.0	COP value of reference AC systems (values available for different cooling capacities).	COP value of AC systems with high market share (values not disclosed).
ID_AM005	Installation of LED Lighting for Grocery Store	02.0	Luminous efficiency of reference LED lighting (110 lm/W).	Luminous efficiency of replaced lighting or conventional lighting otherwise installed without the project.
ID_AM006	GHG emission reductions through optimization of refinery plant operation in Indonesia	01.0	An average of historical specific emissions in some variation of the feed input.	Reference emissions plus emissions from consumption of electricity and steam from outside the process.
ID_AM007	GHG emission reductions through optimization of boiler operation in Indonesia	01.0	Specific CO2 emissions per steam generated of the current boiler, through analysis of historical relationship between steam generation and fuel consumption of boilers.	Reference emission plus emissions from fuel for auxiliary equipment (e.g. fans and pumps).
ID_AM008	Installation of a Separate Type Fridge-Freezer Showcase by Using Natural Refrigerant for Grocery Store to Reduce Air Conditioning Load Inside the Store	02.0	Electricity consumption of both the reference built-in type fridge-freezer showcase and the reference air conditioning system used for cooling the exhaust heat from the reference fridge showcase. (In line with the approved JCM methodology ID_AM004 Ver1.0).	Electricity consumption of built-in type fridge-freezer showcase with high market share and the air conditioning system with high market share used for cooling the exhaust heat from the reference fridge showcase.
ID_AM009	Replacement of conventional burners with regenerative burners for aluminum holding furnace	01.0	Efficiency level of the reference burner (0.682).	Reference emissions plus emissions from power consumption.
ID_AM010	Introducing double-bundle modular electric heat pumps to a new building	01.0	Efficiencies of the reference water heating and cooling equipment (90% efficiency for heating and COP 3.7 for cooling).	Less conservative reference emissions plus emissions of other buildings where the water is also supplied.

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Contoh proyek 1: Energy efficient refrigerants to cold chain industry

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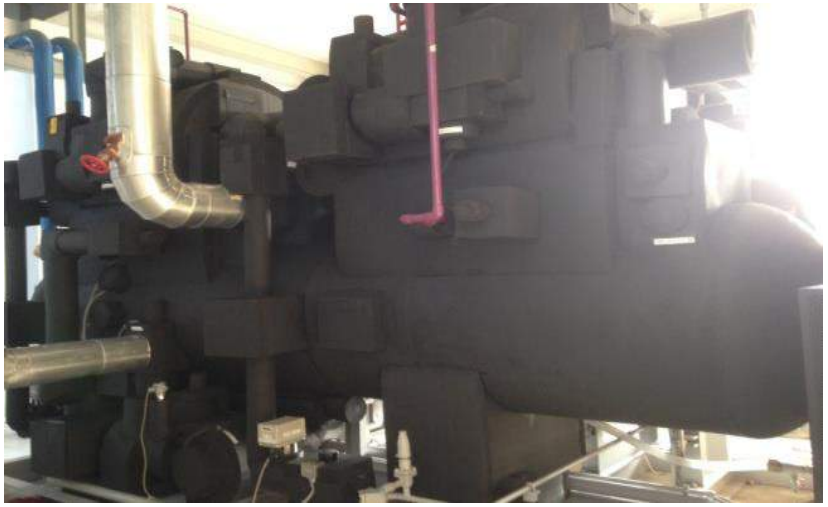
Karawang:

- Teknologi yang dipasang: Compressor (43 KW) dan Intelligent Quick Freezer.
- Dengan menggunakan teknologi Intelligent Quick Freezer, kapasitas produksi di Karawang meningkat dari 2 ton per hari menjadi 4 ton per hari.
- Total jumlah perhitungan pengurangan emisi dalam skema JCM: 11 tCO_2 per tahun.



Bekasi site:

- Tekonologi yang dipasang: Compressor (2x43 KW)
- Chiller digunakan untuk ruangan pendingin (cooling room).
- Di lokasi proyek Bekasi ini, penghematan 20% dari konsumsi energy bisa dicapai dengan proyek ini.
- Jumlah total pengurangan emisi dalam skema JCM: 29 tCO_2

Contoh metodologi 1:

AM_002 Energy Saving by High-Efficiency Centrifugal Chiller (1/3)

- **Applied to the first JCM registered project:** *Energy Saving for Air-Conditioning and Process Cooling by Introducing High-efficiency Centrifugal Chiller,* PT Primatexco – Ebara – Nippon Koei
- Introducing high efficiency centrifugal chiller for the factories etc., which is characterized by:
  - ✓ Non ozone-depleting refrigerant (e.g. HFC 245fa)
  - ✓ Coefficient Of Performance (COP) more than 6.0 (higher than the COP of chillers widely available in the Indonesian market, based on survey)
- Periodical check is planned to be more than four (4) times annually.
- Plan for not releasing refrigerant used for project chiller has been included. In the case of replacing the existing chiller with the project chiller, refrigerant used for the existing chiller is not released to the air e.g. re-use of the refrigerant.

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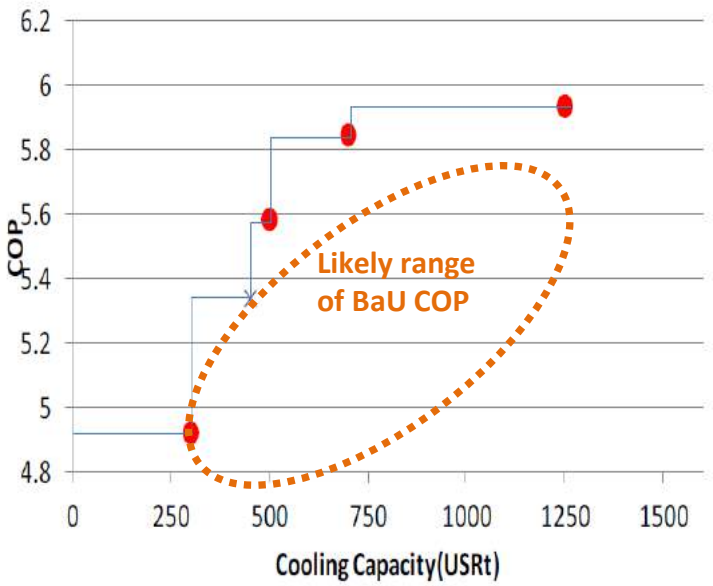
Contoh metodologi 1:

AM_002 Energy Saving by High-Efficiency Centrifugal Chiller (1/3)

- Emission reductions are calculated based on the difference between the amount of project power consumption and reference power consumption which is derived from the ratio of the project COP to the reference COP.
- The reference COP is conservatively set as a default value by taking **maximum COP of commercially available chillers** in the certain cooling capacity.
- The survey was conducted to review the maximum COP of the chillers in Indonesia market for 5 most biggest market share.
- The data of the survey should be renewed every 3 years in order to check the commercially available condition.

Maximum COP value in the respective cooling capacity range



Source: Ministry of the Environment, Japan

Contoh metodologi 1:

AM_002 Energy Saving by High-Efficiency Centrifugal Chiller (1/3)

Reference Emission (RE_P):

$$RE_p = \sum_i \left(EC_{PJ,i,p} \times COP_{PJ,i} \div COP_{RE,i} \times EF_{grid} \right)$$

$EC_{PJ,i,p}$ = Energy consumption from a project i chiller during p period [MWh/p]

$COP_{PJ,i}$ = COP of a project i chiller

$COP_{RE,i}$ = COP of a reference chiller i

Ef_{grid} = National factor emission from national grid [tCO_2/MWh)

Project Emission (PE_P):

$$PE_p = \sum_i \left(EC_{PJ,i,p} \times EF_{grid} \right)$$

Emission Reduction (ER_P): RE_P - PE_P

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Contoh Proyek 2: Power Generation by Waste-heat Recovery in Cement Factory

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PT. Semen Indonesia, Tbk.

JFE Engineering Corporation

Expected carbon emission reduction

122,000

ton CO_2/year

32 MW Waste Heat Recovery Power Generation at Cement Factory.

4 unit kiln di PT. Semen Indonesia di Tuban dimanfaatkan gas buangnya yang masih bersuhu 400^0C. Panas gas buang ditangkap dan dimanfaatkan untuk memanaskan *boiler* dan menghasilkan listrik. Sistem ini mampu memproduksi listrik sampai 25% dari total kebutuhan pabrik

PT. Semen Indonesia at Tuban, East Java

Coordinating Ministry for Economic Affairs Republic of Indonesia

Contoh metodologi 2:

AM_001 Power Generation by Waste Heat Recovery in Cement Industry (1/2)

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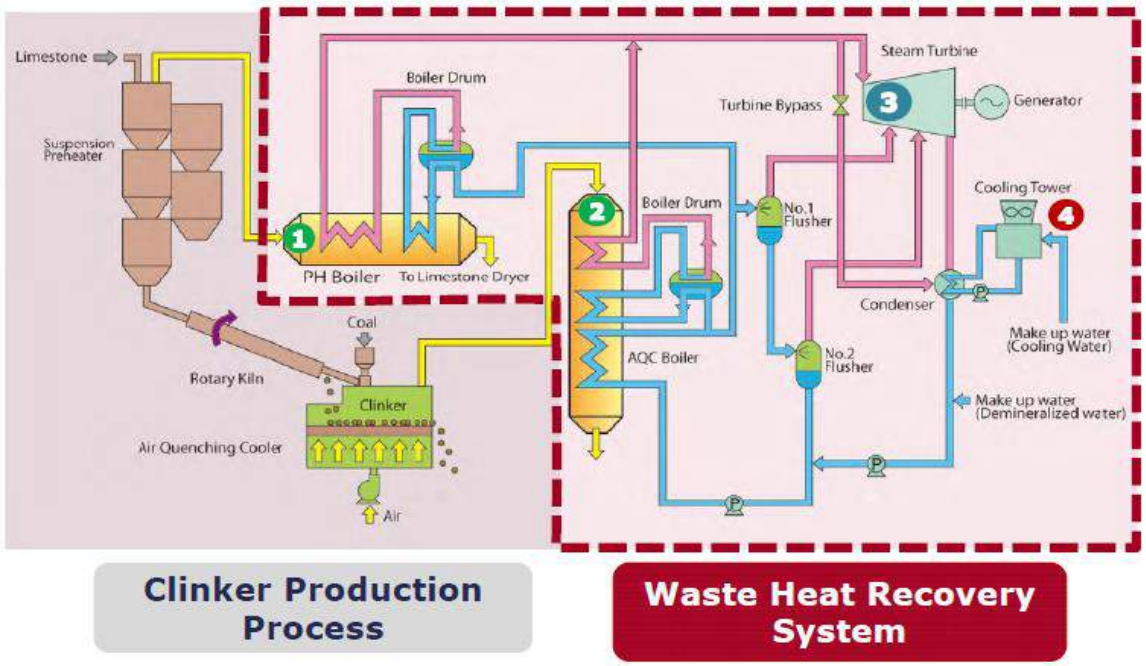
The WHR power generation was built in PT. Semen Indonesia (Persero). It will utilize 4 kiln waste heat which only been released to the open air. The WHR power generation will generate 30,4 MW electricity which will be used for the internal consumption.

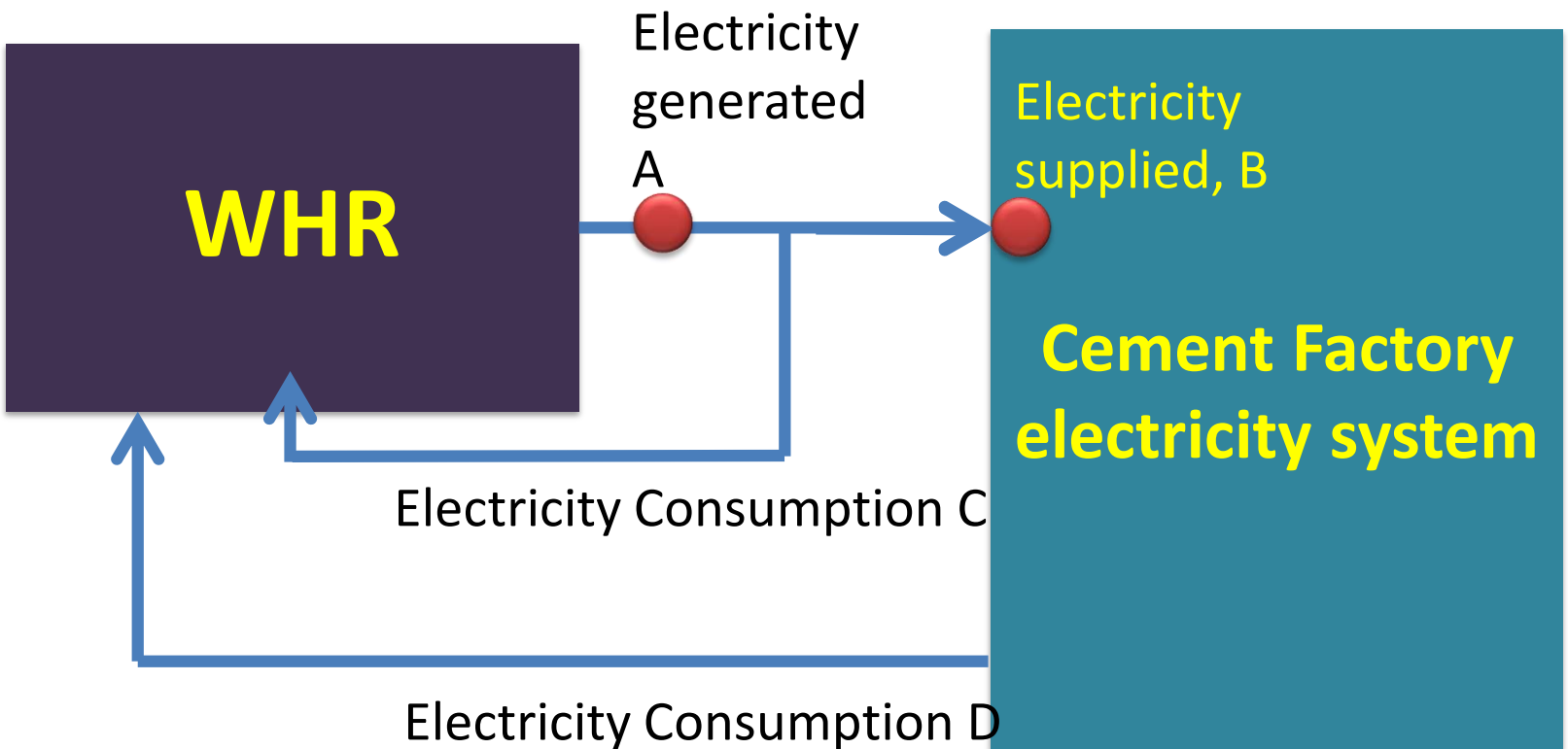


Source: JFE Engineering Corporation

Expected GHG emission reduction: 122,000 tCO_2/year

Contoh metodologi 2:

AM_001 Power Generation by Waste Heat Recovery in Cement Industry (1/2)



Emission reduction = (B – D) x emission factor

Remarks:

- ✓ B will be monitored and measured using continues electric power meter.
- ✓ D will be counted based on the maximum consumption of installed the electricity equi

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Joint Committee Meeting

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Joint Commitee meeting adalah pengambil keputusan tertinggi di dalam skema JCM. Di dalam pertemuan antar dua negara ini diputuskan antara lain mengenai persetujuan metodologi dan perubahannya.

Di dalam Joint Commitee Meeting juga diputuskan perhitungan dan pembagian hasil pengurangan emisi yang diperoleh di dalam implementasi proyek.

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Thank you! Terima kasih!

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