Bolstering Peatlands Restoration in Indonesia through 3Rs Approach

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INDONESIA: LARGEST TROPICAL PEATLAND GLOBALLY (15 Million Hectares)

Sources: Min of Environment and Forestry, Min of Agriculture, BIG
Background (1)

Peatland Degradation Drivers

- Logging (legal & illegal)
- Conversion of peat swamp forest & peatland to other land uses
- Construction of drained canals
- Fires
Impacts of Peatland Degradation

- Loss of PSF ecosystem balance
- Biodiversity loss
- Flood risks (rainy season)
- Peatland & peat forest fires vulnerability (dry season)
- Socio-economic & health costs
“Peatland Restoration Agency (BRG) was established on **January 6, 2016** in order to accelerate the recovery of hydrological & vegetation of degraded peatland that caused by peat and forest fires”

*Government Regulation in Lieu of Law No.1/2016*
BRG’s Principal Tasks and Functions

**Background**

Established to accelerate the recovery of hydrological & vegetation of degraded peatland that caused by peat and forest fires

**Tasks**

To coordinate & to facilitate the implementation of peatland restoration in 7 (seven) Provinces, namely: Riau, Jambi, Sumatera Selatan, Kalimantan Barat, Kalimantan Tengah, Kalimantan Selatan & Papua

- Implementing coordination & strengthening of the national restoration policies;
- Planning, controlling & collaborating on peatland restoration;
- Mapping out of peatland hydrological units (KHG);
- Establishing the protection and cultivation zones;
- Constructing peat rewetting infrastructures and its supporting devices;
- Restructuring the 2015 ex-burnt areas;
- Implementing socialization and education activities on peatland restoration;
- Overseeing the activities of construction, operation & maintenance within concession areas;
- Other functions given by the President.
BRG Restoration target based on Presidential Regulation of the Republic Indonesia Number 1 of 2016

± 2 Million Hectares

FOR

2016 - 2020

30%  20%  20%  20%  10%

2016  2017  2018  2019  2020
Peatland Restoration Steps

**Planning**
- Survey
- Analysis of survey data
- Restoration Plan
- Preparatory of restoration

**Implementing**
- Hydrological functions (R1)
- Revegetation (R2)
- Revitalization of local livelihoods (R3)

**Monitoring & Reporting**
- Monitoring Sites
- Aspects monitored
- Monitoring Methods & techniques
- Monitoring report

**Evaluation (of success)**
- Level of success: Success, Partly Success, Failed
- Recommendations for improvements
**Restoration Strategy & Approach:**

**MoEF**

- BRG's Restoration Strategy & Approach

**BRG**

- MoEF Deputy 1 (PC)
- MoEF Deputy 2 (COM)
- MoEF Deputy 4 (RD)

**PHU Mapping**
- Peat
- Non-Peat

**Rezoning & Zone**
- protected/conservation
- cultivation

**Restoration Priority**
- Protected/Peat dome
- Cultivated w/without permits
- Ex_burnt 2015

**Restoration Plan**
- Conringency plan (R1, R2, R3)
- Annual Plan (R1, R2, R3)

**Implementation of restoration action**
- Rewetting (R1)
- Revegetation (R2)
- Revitalization of livelihoods (R3)

**Monitoring & Evaluation**
BRG's Restoration Measures & Techniques

3R

R1
Rewetting of peatlands
- Canal Blocking
- Canal Backfilling
- Deep wells

R2
Revegetation
- Nursery
- Seedlings
- Seedlings transplantation
- Natural regeneration

R3
Revitalization of local livelihoods
- Land-based: Paludiculture (Sago palm, gelam, Jelutong, swamp taro, etc)
- Water-based: Aqua-culture, fishery
- Env-Services-based: Eco-tourism, carbon

BRG’s Restoration Measures & Techniques (3Rs Approach)
Determination of Restoration Priority Areas

Constituted Ex-burnt 2015?

Yes

Priority 1

No

Is it included as Protected Function?

Yes

Priority 4

No

Are drained canal exists?

Yes

Priority 2

No

Priority 3

Drained Canals Exist?

Yes

Priority 4

No

Not Priority
875 Mha Burnt in 2015
6.2 Mha relatively pristine peat domes
3.1 Mha cultivated area with drained canals

2.8 Mha peat domes with artificial canals
HEAD OF BRG DECREE ON RESTORATION INDICATIVE MAP

SK.05/BRG/Kpts/2016

released on 14 September 2016.

Divide peatland restoration areas to four categories.

- **Protected area**: 684,638 ha
- **Cultivation area with permit**: 1,410,943 ha
- **Cultivation area without permit**: 396,943 ha

**Restoration target**: 2,492,527 ha
## BRG Restoration Target based on Priority Restoration Criteria

<table>
<thead>
<tr>
<th>PROVINCE</th>
<th>Ex-burnt 2015</th>
<th>Peat Dome with Canals</th>
<th>Shallow Peat with Canals</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Production Areas - Licensed</td>
<td>Production Areas – Non Licensed</td>
<td>Protection Areas (KK &amp; HL)</td>
<td>Production Areas - Licensed</td>
</tr>
<tr>
<td>RIAU</td>
<td>38,884</td>
<td>63,535</td>
<td>2,008</td>
<td>668,502</td>
</tr>
<tr>
<td>JAMBI</td>
<td>19,245</td>
<td>26,008</td>
<td>19,642</td>
<td>80,530</td>
</tr>
<tr>
<td>SUMSEL</td>
<td>172,290</td>
<td>76,797</td>
<td>41,277</td>
<td>305,573</td>
</tr>
<tr>
<td>KALBAR</td>
<td>1,769</td>
<td>27,239</td>
<td>2,850</td>
<td>62,308</td>
</tr>
<tr>
<td>KALTENG</td>
<td>16,057</td>
<td>162,951</td>
<td>155,899</td>
<td>13,754</td>
</tr>
<tr>
<td>KALSEL</td>
<td>1,586</td>
<td>11,153</td>
<td>26,022</td>
<td>278</td>
</tr>
<tr>
<td>PAPUA</td>
<td>4,144</td>
<td>29,262</td>
<td>4,659</td>
<td>278</td>
</tr>
<tr>
<td>Total</td>
<td>253,975</td>
<td>396,945</td>
<td>226,335</td>
<td>1,156,968</td>
</tr>
</tbody>
</table>

KK=Kawasan Konservasi or Conservation Areas  
HL=Hutan Lindung or Protections Forests
Restoration Targets based on Management Areas

Restoration Targets
2.5 Million Ha

National and Regional Govt. 0.689 Mha
- Conservation Areas 0.337 Mha
- Protection Areas 0.352 Mha

Communities, NGOs, CBOs 0.396 Mha
- Production Forests 0.234 Mha
- Forest for Other Land Uses (APL) 0.162 Mha

Concessions 1.4 Mha
- Production Areas of Peat 0.250 Mha
- Protection Areas of Peat 1.15 Mha
# RESTORATION TARGETS SCHEME

<table>
<thead>
<tr>
<th>Year</th>
<th>Restoration Targets</th>
<th>Priority Mapping Result</th>
<th>Non-Licensed</th>
<th>Licensed</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>600,000</td>
<td>0</td>
<td>0</td>
<td>600,000</td>
</tr>
<tr>
<td>2017</td>
<td>400,000</td>
<td>235,000</td>
<td>325,000</td>
<td>325,000</td>
</tr>
<tr>
<td>2018</td>
<td>400,000</td>
<td>325,500</td>
<td>285,500</td>
<td>285,500</td>
</tr>
<tr>
<td>2019</td>
<td>400,000</td>
<td>325,500</td>
<td>200,900</td>
<td>200,900</td>
</tr>
<tr>
<td>2020</td>
<td>200,000</td>
<td>195,600</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>2,000,000</td>
<td>1,081,600</td>
<td>1,411,400</td>
<td></td>
</tr>
</tbody>
</table>
PHUs RESTORATION TARGET Up to 2020

Based on: MoEF Decree No. SK.129/MENLHK/SETJEN/PKL.0/2/2017 concerning the determination of national peatlands Hydrological Units (PHUs)

<table>
<thead>
<tr>
<th>No</th>
<th>Year</th>
<th>Based on PHUs Data in 2016</th>
<th>Based on PHUs data in 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2017</td>
<td>23</td>
<td>33</td>
</tr>
<tr>
<td>2</td>
<td>2018</td>
<td>22</td>
<td>24</td>
</tr>
<tr>
<td>3</td>
<td>2019</td>
<td>20</td>
<td>29</td>
</tr>
<tr>
<td>4</td>
<td>2020</td>
<td>19</td>
<td>18</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>84</td>
<td>104</td>
</tr>
</tbody>
</table>
Target of Peat Ecosystems Restoration Plan (2017 Contingency Plan) *revised

33 Peat Hydrological Unit (PHUs)
36 Regencies
6 Provinces

KHG Pulau Padang
KHG Pulau Tebing Tinggi
KHG Sungai Kampar - Sungai Gaung
KHG Sungai Rokan - Sungai Siak Kecil
KHG Sungai Kiyap – Sungai Kerinci
KHG Sungai Siak – Sungai Kampar
KHG sungai Tapung Kiri –Sungai Kiyap

KHG Sungai Kapuas – Sungai Barito
KHG Sungai Kahayan - Sungai Kapuas
KHG Sungai Kahayan - Sungai Sebangau
KHG Sungai Katingan - Sungai Sebangau

KHG Sungai Mendahara - Sungai Batanghari
KHG Sungai Baung – Sungai Betara
KHG Sungai Betara – Sungai Mendahara
KHG Sungai Pengabuan – Sungai Baung

KHG Sungai Air Hitam Laut - Sungai Buntu Kecil*
KHG Sungai Lalan – Sungai Merang
KHG Sungai Merang – Sungai Ngrawan
KHG Sungai Ngrawan – Sungai Sembilang
KHG Sei Lalan – Sungai Bentayan
KHG Sungai Bentayan - Sungai Penimpahan
KHG Sungai Penimpahan – Sungai Air Hitam
KHG Sungai Sugihan - Sungai Lumpur
KHG Sungai Saleh- Sungai Sugihan

KHG Sungai Ambawang - Sungai Kubu
KHG Sungai Kapuas - Sungai Simpang Kanan
KHG Sungai Landak - Sungai Mempawah
KHG Sungai Punggurbesar - Sungai Ambawang

KHG Sungai Balangan - Sungai Batangalai
KHG Sungai Barito - Sungai Alalak
KHG Sungai Barito - Sungai Taping
KHG Sungai Utar - Sungai Serapat*

*Cross Province KHG
Data Source: KHG MoEF – March 2017
### 2017 Contingency Plan Activity based on Peat Management Restoration Unit

<table>
<thead>
<tr>
<th>No</th>
<th>Peat Management Restoration Unit</th>
<th>R1 : Rewetting</th>
<th>R2 : Revegetation (ha)</th>
<th>Natural Succession /generation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Deep Well (unit)</td>
<td>Canal Blocking (point)</td>
<td>Canal Section (m)</td>
</tr>
<tr>
<td>1</td>
<td>Regional Gov. (Regency/Province) – APL</td>
<td>3,653</td>
<td>18,317</td>
<td>7,861,726</td>
</tr>
<tr>
<td>2</td>
<td>Provincial Gov. – Department of Forestry (HL&amp;HP)</td>
<td>10,837</td>
<td>8,766</td>
<td>4,276,147</td>
</tr>
<tr>
<td>3</td>
<td>UPT - KSDAE (Directorate General of Natural Resources and Ecosystem Conservation) MoEF</td>
<td>10,124</td>
<td>781</td>
<td>170,436</td>
</tr>
<tr>
<td>4</td>
<td>HGU* (38 concessions) – Palm Oil or Coconut</td>
<td>140</td>
<td>3,755</td>
<td>2,754,894</td>
</tr>
<tr>
<td>5</td>
<td>IUPHK HT (48 concessions) - Timber Plantation</td>
<td>4,804</td>
<td>2,435</td>
<td>3,754,099</td>
</tr>
<tr>
<td>6</td>
<td>IUPHK HA (9 concessions) - Logging</td>
<td>274</td>
<td>287</td>
<td>324,725</td>
</tr>
<tr>
<td></td>
<td><strong>Grand Total</strong></td>
<td><strong>29,832</strong></td>
<td><strong>34,341</strong></td>
<td><strong>19,142,027</strong></td>
</tr>
</tbody>
</table>

*exclude IUP or Plantation Permit*
PEAT REWETTING (R1)

PEAT REWETTING INFRASTRUCTURE DEVELOPMENT: PRINCIPLES, APPROACH & DESIGN
Principles and Approaches for Peatland Rewetting Infrastructures Development (PRID)

- Landscape/Peatland Hydrological Unit (PHU)-based;
- Closed System;
- Principal goal of PRID: Hydrological recovery via increased water retention & reduced *run-off* from the system;
- Goals based on area functions: **Cultivation function**: *Water management* & **Conservation/protection function**: *Water conservation*
- *Social Safeguard*, FPIC principles
**BRG’s Rewetting Techniques**

- **Canal Blocking**
  - With spillway & Non-spillway
  - Soft structure/hard structure
  - Applicability: Conservation/protected & Cultivation functions

- **Canal Backfilling**
  - Soft structure (compacted peat)
  - Semi-Hard structure (a combination of timber & compacted peat)
  - Application: conservation function

- **Deep Wells**
  - Simple deep-wells
  - Functionality: peat rewetting
  - Applicability: both conservation/protection & cultivation functions
Peat Rewetting Techniques

Canal blocking

• **Goal:** To reduce run-off & increase water retention in the canals & its adjacent site
• **Design:** Single, multi-sheet piles box dams, soil bags, compacted peat, gabions, rock, pre-cast, water gates, etc.
• **Structure materials:** wooden, concrete, plastics, etc.
• **Infill materials:** mineral/alluvial soils, high decomposed peat (sapric, hemic)

Canal Backfilling

• **Goal:** to increase sedimentation in the canals so that its drainability can be reduced
• **Design:** partly segments of the drained canals are infilled (100-300m) for certain interval (every 1 Km),
• **Infill materials:** peats from berms, coarse on-site organics materials (death woods, tree branches, stems, etc.

Deep well

• **Golas:** to rewet peat notably during the dry seasons so that the peat is still wet and moist enough;
• **Functionality:** source of water for peat rewetting activities as well as fire suppression.
• **Type:** Simple deep wells
Canal Blocking
Canal Blocking:
A water weir (dam) that is installed in canal or ditch body aims at reducing run off and to retaining water within canal/ditch body and its surrounding areas

Canal blocking working principle:
Retaining water and storing water as much and long as possible with Peatland Hydrological Unit (PHU)
TYPES OF CANAL BLOCKING

Based on Construction Age:

- Short-term (temporary)
- Medium-term (Semi-permanent)
- Long-term (Permanent)

Based on Main Structures and Construction Materials:

- Wooden dam (Single sheet/plank dam, multi-sheet piles);
- Soil bags;
- Rock;
- Compacted peat;
- Concrete;
- Gabions;
- Pre-cast; and
- Water gate.
**CANAL BLOCKING TYPES & DESIGNS:**

**WOODEN DAM**

**Wooden Dam ~ Two sheet piles (non-spillway)**

**Wooden Dam ~ Two Sheet piles (w/spillway)**

Design & photo: Alue Dohong, 2016
CANAL BLOCKING DETAIL DESIGN
(Canal blocking with Spillway (canal width: 6m-20m) Three Sheet Piles)
CANAL BLOCKING TYPES & DESIGNS:
Compacted Peat & Concrete

- **Compacted peat Dam**
- **Concrete (w/non-spillway)**

Design & photo: Deltares, 2015
Design & photo: Budi Triadi, Puslitbang SDA-PU, 2014
CANAL BLOCKING TYPES & DESIGNS:
Gabions & Pre-cast

Gabions

Design & photo: Ng Kok Seng, 2011

Pre-cast

Design & photo: Ng Kok Seng, 2011
Design & photo: Saragih, 2013
Canal Backfilling
Canal Backfilling:

One of the rewetting techniques where open drained canal or ditch is refilled with on-site organic peat and/or coarse organic materials (tree branches, stems, leaves, etc.) so that the canal/ditch will be shallowed and sedimented thereby the dwater drainability rate of the canal/ditch is reduced (Houterman & Ritzema, 2009; Applegate dkk, 2012; Dohong, A, 2016).

Canal backfiling goal:

Water conservation through the increase of water shallowness and sediment of the canal/ditch body so its drainability can be reduced and water retention can be increased within canal/ditch body and its surrounding areas.
Model Design  Canal Backfilling
Model Design  *Canal Backfilling*
Model Design  Canal Backfilling
Model Design  Canal Backfilling

Note:
Panjang Jarak Maksimal antar back filling satu dengan lainnya adalah maksimal 1 Km atau melihat ketersediaan tanah eksisting yang ada.
<table>
<thead>
<tr>
<th>Approx. rewetting area</th>
<th>20,992.10 Ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>PHU KAPUAS-BARITO (Central Kalimantan), Block A North-West, EMRP</td>
</tr>
<tr>
<td>Interventions</td>
<td></td>
</tr>
<tr>
<td>Canal Backfilling</td>
<td>100 Units</td>
</tr>
<tr>
<td>Can Blocking</td>
<td>-</td>
</tr>
<tr>
<td>Deep well</td>
<td>-</td>
</tr>
<tr>
<td>Implementer</td>
<td>Contractor (in collaboration with Public work)</td>
</tr>
<tr>
<td>Budget</td>
<td>IDR 17,270,000,000.00 (equiv. A$1,727,000)</td>
</tr>
<tr>
<td>Current Progress</td>
<td>Bidding preparation</td>
</tr>
</tbody>
</table>
DEEP WELL
# Main Characteristics & Locations Requirements of Deep Wells:

<table>
<thead>
<tr>
<th>Characteristics &amp; Requirements</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>BRG’s Restoration Priority Areas</td>
<td>Priority 1, Priority 2, Priority 3 &amp; Priority 4</td>
</tr>
<tr>
<td>Forest Function Based</td>
<td>Protected/Conservation &amp; Cultivation</td>
</tr>
<tr>
<td>Source of Water Availability</td>
<td>• Surface water: Very limited;</td>
</tr>
<tr>
<td></td>
<td>• Aquifer: High Potential</td>
</tr>
<tr>
<td>Accessibility</td>
<td>• Very limited from Natural Source of water (River, Lake);</td>
</tr>
<tr>
<td></td>
<td>• Lack of accessibility infrastructure (road, bridge, canal)</td>
</tr>
</tbody>
</table>
Coverage area \((A) = \pi r^2\)

Where:

\[\pi = \frac{22}{7} = 3.14\]

\[r = \text{radius length of thrower hose (m)}\]
REVEGETATION (R2)
## Revegetasi Aspects:

<table>
<thead>
<tr>
<th>Aspects</th>
<th>Cultivation</th>
<th>Conservation &amp; Protected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peat</td>
<td>Swallow-Medium</td>
<td>Peat dome &amp; Peat depth &gt;3 meters</td>
</tr>
<tr>
<td>The Existence of Artificial drainage</td>
<td>Peat Rewetting Infrastructures have been established (<em>water management</em>)</td>
<td>Peat Rewetting Infrastructures have been established (<em>water conservation</em>)</td>
</tr>
<tr>
<td>Land Cover</td>
<td>Minimum</td>
<td>Secondary</td>
</tr>
<tr>
<td>Species</td>
<td>Endemic, adaptive</td>
<td>Endemic</td>
</tr>
<tr>
<td>Land Ownership Status</td>
<td>Clear and clean</td>
<td>Stateland</td>
</tr>
<tr>
<td>Hidrology</td>
<td>No flood (long)</td>
<td>No flood (long)</td>
</tr>
</tbody>
</table>
REVEGETATATION STRATEGY

REVEGETATION

Active Intervention

NURSERY
- Preparation
- Development
- Maintenance

SEEDLING BANKS
- Preparation
- Seedlings procurement
- Maintenance

SEEDLINGS TRANSPLANTATION
- Survey
- Preparation (seedlings, planting paths)
- Planting
- Maintenance

Wilding

Generative/Seeds

Vegetative/Stem Cutting

Natural Succession
REVEGETATION: LOCATION & SPECIES TYPES

REVEGETATION LOCATIONS

CULTIVATION

Endemic
- Woody species
- Non-Woody species

Adaptive
- Woody species
- Non-Woody species

CONSERVATION/PROTECTED

Endemic
- Woody species
- Non-woody species
REVEGETATION: Technical Guidance

Nursery, Seedlings & Planting
REVITALIZATION OF LOCAL LIVELIHOODS (R3)
REQUIREMENTS FOR LIVELIHOODS ACTIVITIES

1. Wet and moisture friendly;
2. Minimum drainage and fire use
3. Not against upon peatland restoration & conservation;
4. Local knowledge & local wisdom-based;
5. High community participation and empowerment;
6. Not against law (illegal logging, electricity fishing, ect.)
7. Support local economy
8. Support local employment
9. Economically and environmentally feasible
REVITALIZATION OF LOCAL LIVELIHOOD (R3)

LAND-BASED
- Paludiculture
- Animal Husbandary
  - Zero Burning Agr
- Sago
- Grasses
- ect
- Cowi
- Chicken
- Goat
- Ect

WATER-BASED
- Aquaculture
- Fishery
- Eco-tourism
- Carbon

ENV. SERVICES-BASED
Terima Kasih

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