



GEOCAP
Geothermal Capacity Building Program Indonesia - Netherlands

*Presentation for GEOCAP Workshop at ITB,
Bandung 7 April 2016*

MARKET SURVEY

Potential Direct Use of Geothermal Waste Heat
in West Java

Outline

- Resource Assessment
- Market Identification
- Matching Up Resource and Demand
- Potential Candidates
- Further Works and Obstacles

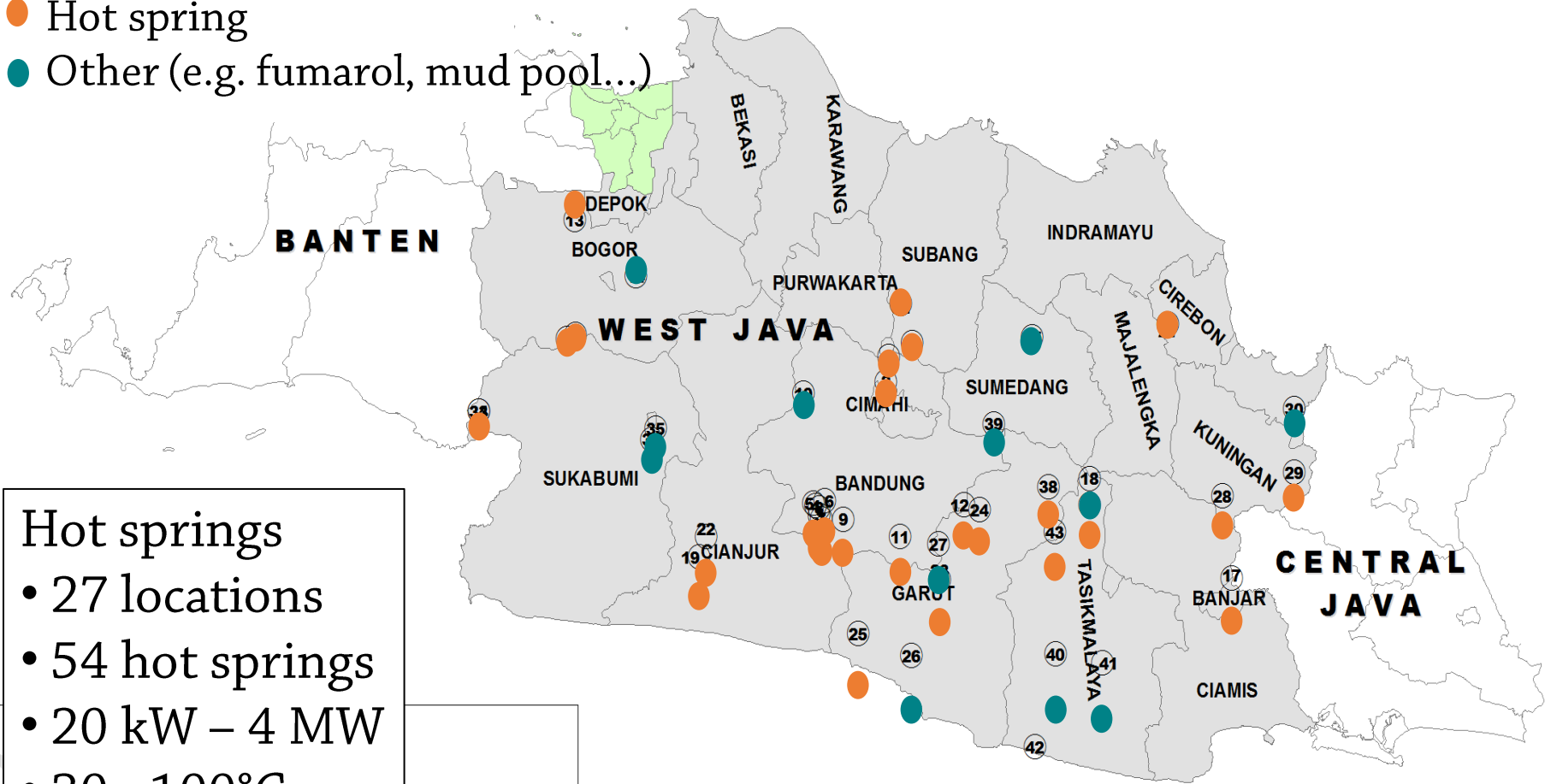
Resource Assessment

Type of heat sources

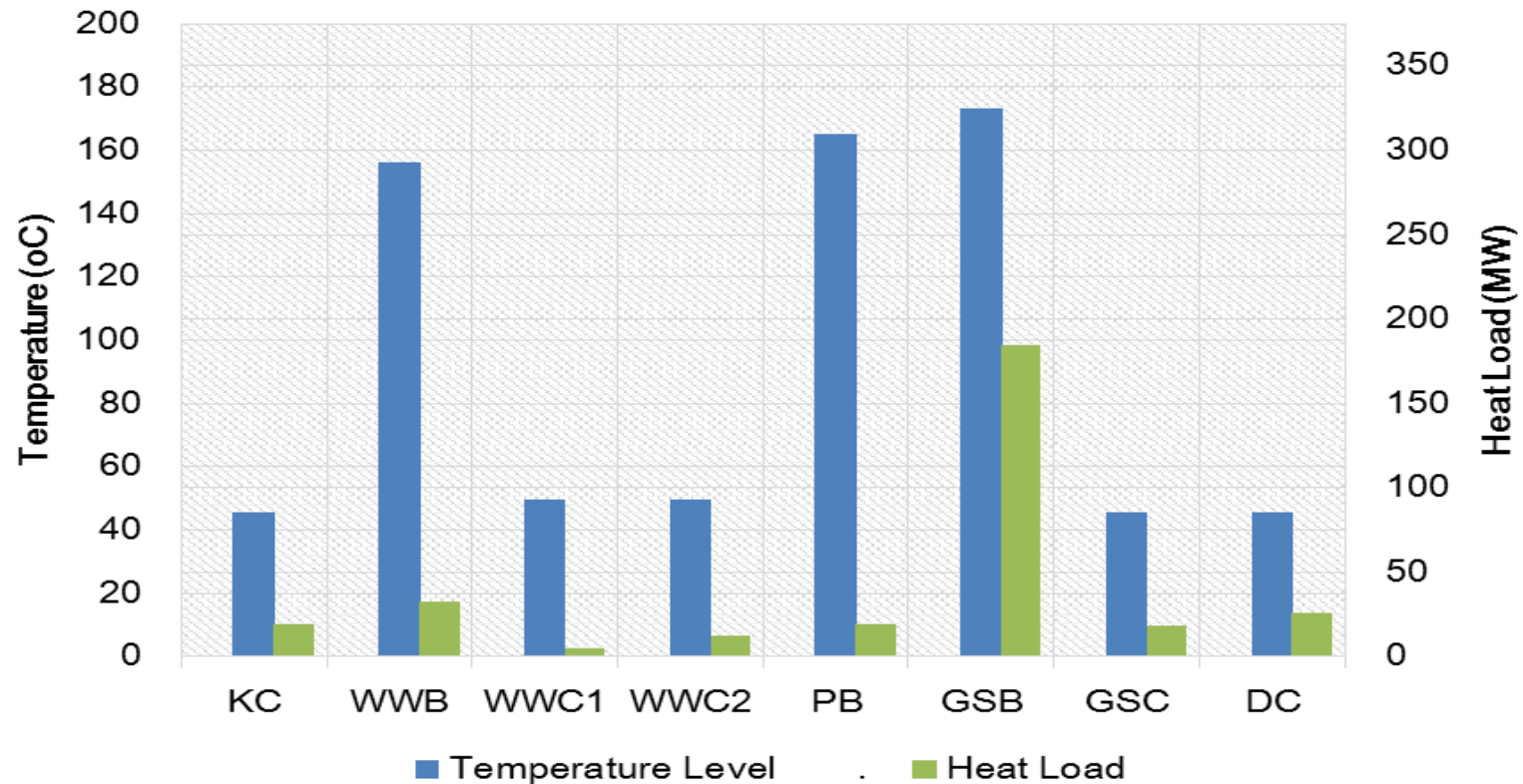
- **Volcanic-Manifestation** (e.g. hot springs, fumaroles)
[surface] -UI
- **Geothermal Waste Heat** (e.g. brine, condensate)
[surface] –UI
- **Non Volcanic-Hot Aquifer** (**Sedimentary basin**)
[subsurface]-ITB

Surface manifestations

- Hot spring
- Other (e.g. fumarol, mud pool...)



Potential **geothermal waste heat** from geothermal power plants in West Java



KC = Kamojang Condensate, WWB = Wayang Windu Brine, WWC1= Wayang Windu Condensate 1, WWC2 = Wayang Windu Condensate 2, PB = Patuha Brine, GSB = Gunung Salak Brine, GSC = Gunung Salak Condensate, DC = Darajat Condensate

Existing Geothermal Power Plant in West Java

No.	Geothermal Prospect	Waste Heat	Temperature (°C)	Pressure (bar)	Flow Rate (kg/s)	Heat Load (MW)
1	Kamojang (K)	Condensate	46*	0.1	100	19.18
2	Wayang Windu (WW)	Brine	156*	5.6	50	32.94
3		Condensate 1	49*	5.3	26	5.38
4		Condensate 2	49*	0.9	60	12.41
6	Patuha (P)	Brine	165*	7.0	27.78	19.36
8	Gunung Salak (GS)	Brine	173	6.6	252	184.97
9		Condensate	46*	0.1	N/A	18.43
10	Darajat	Condensate	46*	0.1	135	25.89



Waste heat power plants

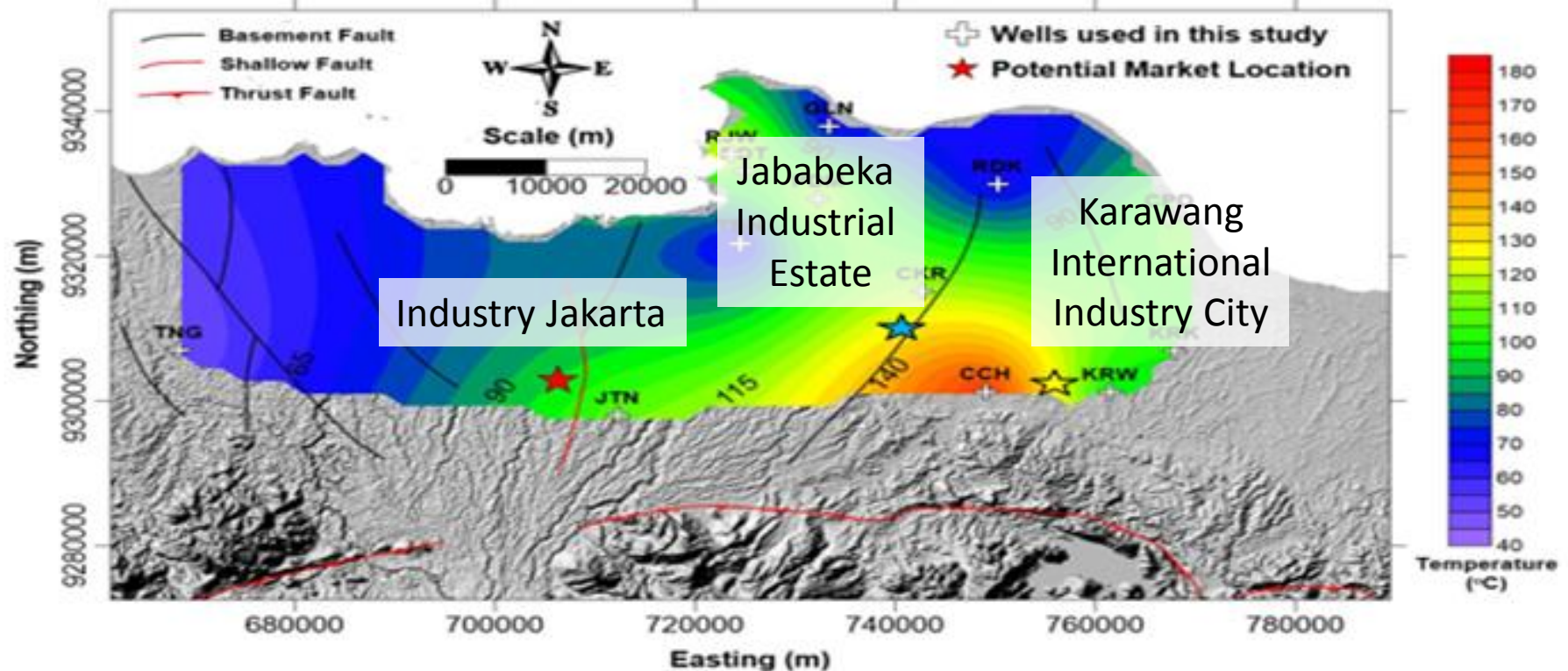
- Brine
- Condensate
- Brine and condensate



Waste heat

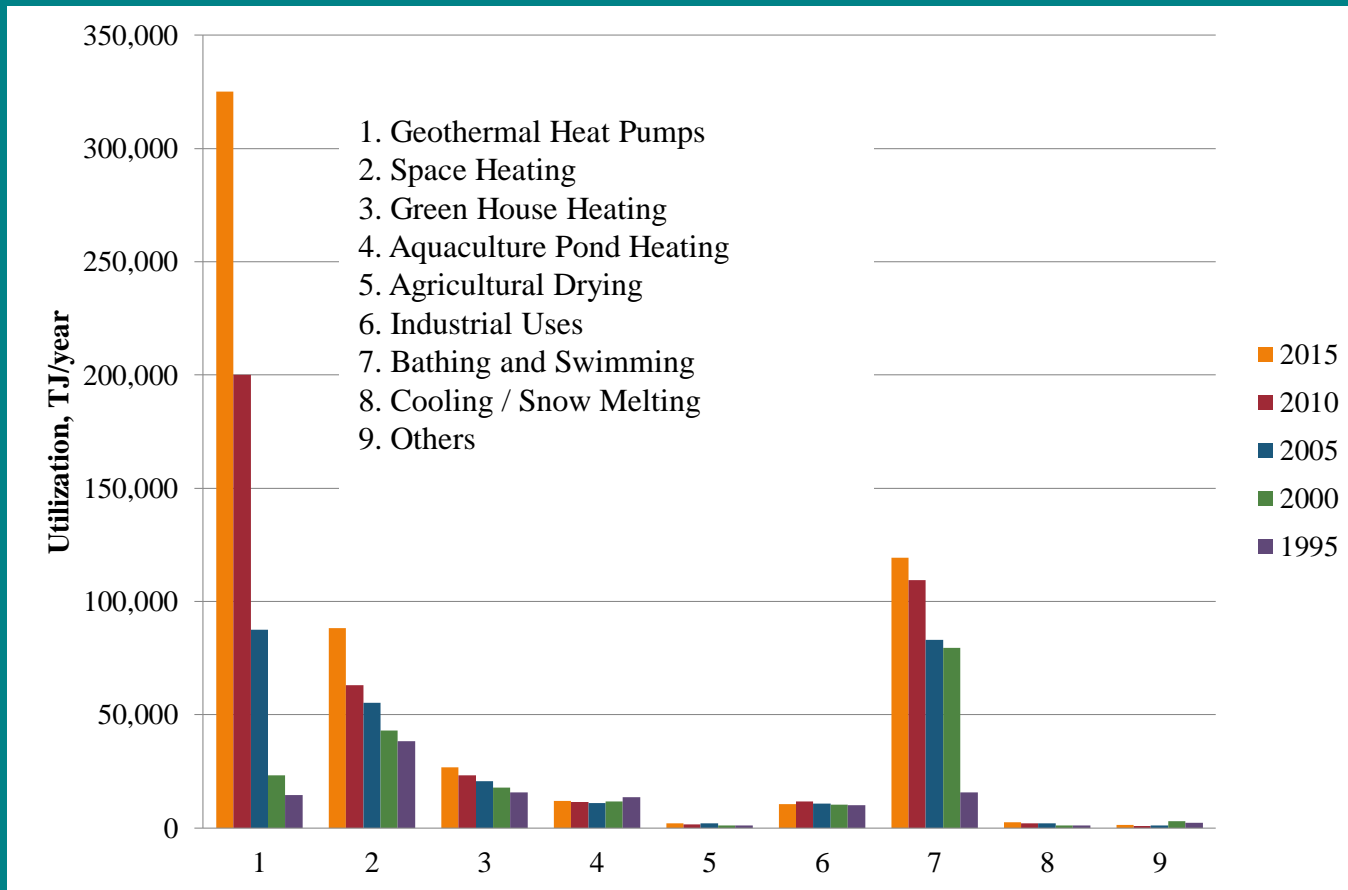
- 5 locations
- 20 MW – 185 MW
- 45 - 175°C

Onshore Northwest Java Basin (Potential Hot **Sedimentary Basin**)



Market Identification

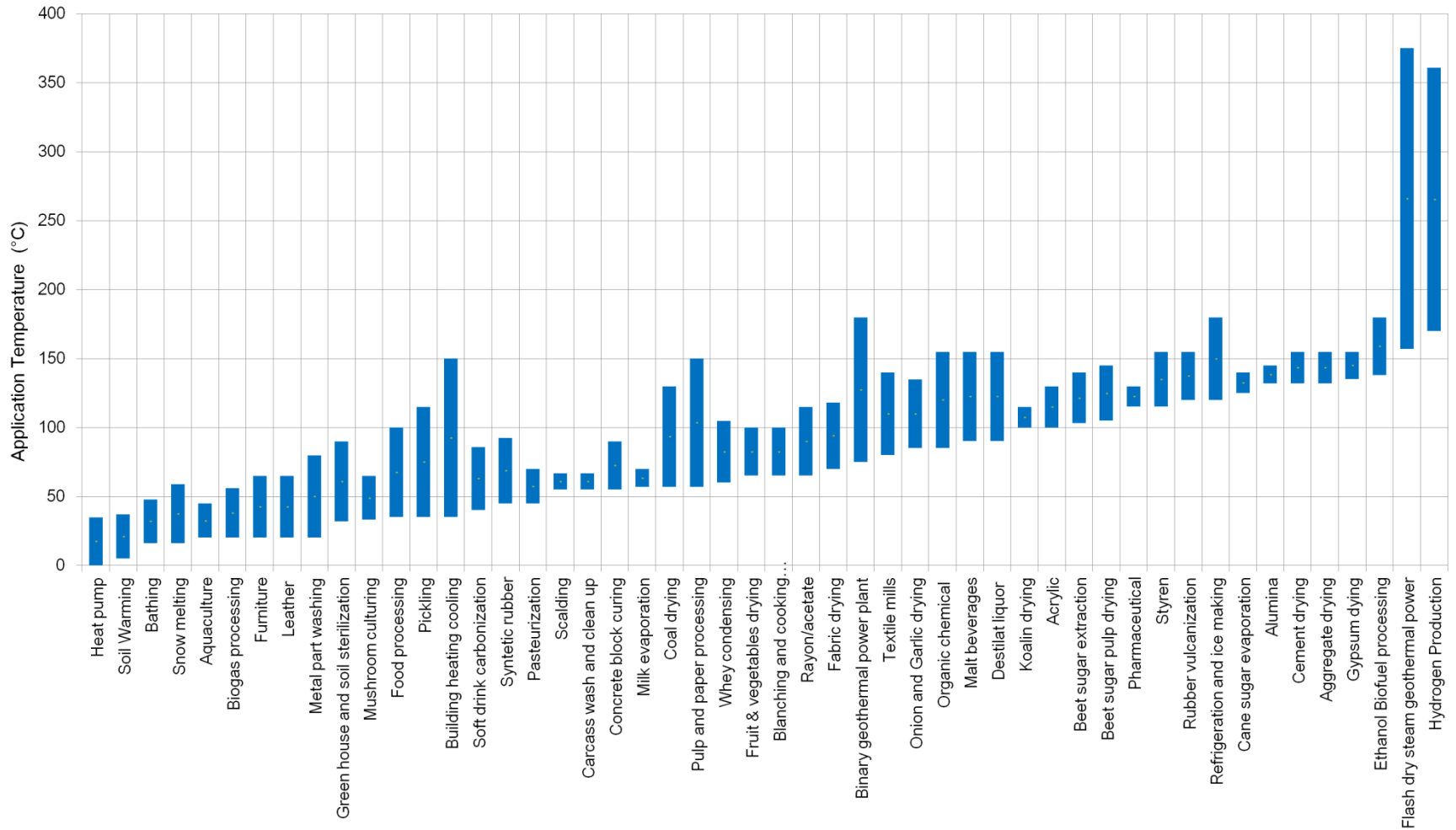
Geothermal direct-use in worldwide



Market survey

- Low – medium enthalpy for:
 - Direct use
 - Electricity production (ORC)
 - Cooling

Market Identification: Lindall Diagram



Direct use - potential

Bathing

Biogas

Leather

Soft drink

Milk

Bathing

Milk processing

Cane sugar Vegetable

Biofuel

Fruit

Biofuel Vegetable

Cane sugar

Milk

Fish farming

Fish drying

Tea

Brick

Wood

Cloce

Coconut

Soft drink

Bathing

Mushroom

Potato

Tea

Milk

Textile

Leather

Direct use - existing

Market	Temperature	Type	Location
Catfish farming	40°C	Commercial	Lampung
Warm bathing	43-45°C	Commercial	West/Central/East Java, Bengkulu
Mushroom & potato cultivation	60-65°C	Pilot	Pangalengan
Mushroom cultivation	60-65°C	Pilot	Kamojang
Cacao & coconut drying	60-80°C	Pilot	Way Ratai
Tea drying	98-120°C	Pilot	Pangalengan
Palm sugar processing	107-110°C	Commerical	Lahendong

Matching Up Resources and User Demands

Criteria for screening:

- Distance from resources to demand sites ≤ 20 km
- Maximum temperatures of demand $<$ surface temperatures of geothermal heat sources
- Heat duties of demand $<$ heat loads of resources

Match source - demand

- 26 small-medium enterprises
- 10 kW – 3.000 kW
- 55 – 150°C
- Milk industry
- Textile industry
- Tea industry
- Vertiver oil
- More food industry...

Summarized Matrix of matching-up potential market West Java

No	Company	Type of Product	Production Capacity	Volcanic Manifestation		Geothermal Waste Heat		
				Kawah Kamojang	Kawah Hujan	WWB	PB	GSB
				91.5 °C, 0.74 MW	94 °C, 0.76 MW	156 °C, 32.9 MW	165 °C, 19.4 MW	173 °C, 185 MW
1	PO Gunt	Soya Powder	324 kg/ year					20 km, 70 °C, 0.01 kW
2	PO Sawargi	Choco Powder	120 ton /year	7.32 km, 70 °C, 4.19 kW	7.32 km, 70 °C, 4.19 kW			
3	PO Karya Mulya	Jams	144 ton/ year	12.01 km, 82 °C, 1.57 kW	12.01 km, 82 °C, 1.57 kW			
4	CV Tepung Hoenkwe Cap Boenga	Flour	60.87 ton/ year					13 km, 55 °C, 1.93 kW
5	PO Wali Songo	Dried Mango	1,200 can/ year					18 km, 70 °C, 0.03 kW



Summarized Matrix of matching-up potential market in West Java (cont.)

No	Company	Type of Product	Production Capacity	Volcanic Manifestation		Geothermal Waste Heat		
				Kawah Kamojang	Kawah Hujan	WWB	PB	GSB
				91.5 °C, 0.74 MW	94 °C, 0.76 MW	156 °C, 32.9 MW	165 °C, 19.4 MW	173 °C, 185 MW
6	CV Glisindo	Soya Powder	5 ton/ year	12.93 km, 70 °C, 0.23 kW	12.93 km, 70 °C, 0.23 kW			
7	PT Tirta Fresindo	Minuman berkarbonasi	7,400 kL/ year					15 km, 57.2 °C, 59.47 kW
8	PT Satya Sumba Cemerlang	Textile	480 ton/ year	10.12 km, 80 °C, 11.63 kW	10.12 km, 80 °C, 11.63 kW	19 km, 80 °C, 11.63 kW		
9	PT Bintang Indospin Industri	Textile	8,550 bale/ year	16.33 km, 80 °C, 37.58 kW	16.33 km, 80 °C, 37.58 kW			
10	PT Sejahtera Bintang Abadi Textile	Textile	20,000 bale/ year	12.75 km, 80 °C, 87.91 kW	12.75 km, 80 °C, 87.91 kW	18 km, 80 °C, 87.91 kW		
11	PT Tribintang Lokawarna, Laswi, Bandung	Textile	269 ton/ year	11.73 km, 80 °C, 6.52 kW	11.73 km, 80 °C, 6.52 kW			
12	PT Pavettia Atsiri Indonesia	Vetiver oil	1,500 kg/ year					20 km, 140 - 150 °C, 0.23 kW



Summarized Matrix of matching-up potential market in West Java (cont.)

No	Company	Type of Product	Production Capacity	Volcanic Manifestation		Geothermal Waste Heat		
				Kawah Kamojang	Kawah Hujan	WWB	PB	GSB
				91.5 °C, 0.74 MW	94 °C, 0.76 MW	156 °C, 32.9 MW	165 °C, 19.4 MW	173 °C, 185 MW
13	PT ISAM Bandung	Milk	100 ton/ day			9 km, 130 - 150 °C, 948.38 kW		
14	Amerta Indah Otsuka (Pocari Sweat)	Isotonic Drink	45.8 kL/ day					13 km, 70 - 80 °C, 188.61 kW
15	Indolakto	Milk	217,100 ton/ year					13 km, 70 - 93 °C, 2,940.82 kW
16	Asia Sejahtera Perdana Pharmaceutical (Kratingdaeng)	Energy Drink	100 kL/ day			20 km, 70 - 80 °C, 411.82 kW		
17	PT Djojonegoro C-1000	Vitamin Healthy Drink	46.7 kL/ day					13 km, 70 - 80 °C, 192.32 kW



Summarized Matrix of matching-up potential market in West Java (cont.)

No	Company	Type of Product	Production Capacity	Volcanic Manifestation		Geothermal Waste Heat		
				Kawah Kamojang	Kawah Hujan	WWB	PB	GSB
				91.5 °C, 0.74 MW	94 °C, 0.76 MW	156 °C, 32.9 MW	165 °C, 19.4 MW	173 °C, 185 MW
18	Yakult Indonesia Persada	Fermented Milk	247 kL/ day					13 km, 120 °C, 1,783 kW
19	Patuahwatte tea PT Indorub Sumber Wadung	Black Tea	2,400 ton/ year				3 km, 98 - 120 °C, 170 kW	
20	PTPN VIII Sinumbra Unit	Black Tea	3000 ton/ year				5 km, 98 - 120 °C, 170.37 kW	
21	PT. Indofood Asahi	Beverage	389.6 kL/ day					13 km, 70 - 80 °C, 641.78 kW
22	PTPN VIII Kertamanah Unit	Black Tea	2470 ton/ year			3.7 km, 98 – 120 °C, 174,96 kW		
23	Samarang Vertiver Oil	Vertiver oil	1,500 kg/ year			(Kamojang Condensate; 46 °C, 19.2 MW) 6 km, 120-140 °C, 281.16 kW		



Summarized Matrix of matching-up potential market in West Java (cont.)

No	Company	Type of Product	Production Capacity	Volcanic Manifestation		Geothermal Waste Heat		
				Kawah Kamojang	Kawah Hujan	WWB	PB	GSB
				91.5 °C, 0.74 MW	94 °C, 0.76 MW	156 °C, 32.9 MW	165 °C, 19.4 MW	173 °C, 185 MW
24	PTPN VIII Malabar Unit	Black Tea	4,290 ton/year			14 km, 98-120 °C, 113,58 kW		
25	PTPN VIII Rancabolang Unit	Black Tea	1,900 ton/year				98-120 °C, 256,46 kW	
26	Parakan Salak	Black Tea	3,000 ton/year					6 km, 98 – 120°C, 212,5 kW



Potential Candidates of Direct Use

- Essential oil companies are identified in 2 locations. 1 potential candidate, a **vertiver oil** refinery in *Samarang, Garut*, is close to **Kamojang condensate**, so the temperature level of the heat source is not enough, so it is necessary to find another supply coming from abandon geothermal well.
- **Tea drying**, there are 5 locations. 2 potential candidates are *Rancabolang and Kertamanah plantations (PTP VIII)* because they are close to the heat source of **Wayang Windu brine**.
- Beverage and **soft drink** companies are identified in 7 locations. 4 potential candidates are located quite close to the heat source of **Gunung Salak brine** i.e. *PT. Djojonegoro C-1000, PT. Indolakto, PT. Asahi Indofood, and Yakult Indonesia* in Sukabumi.



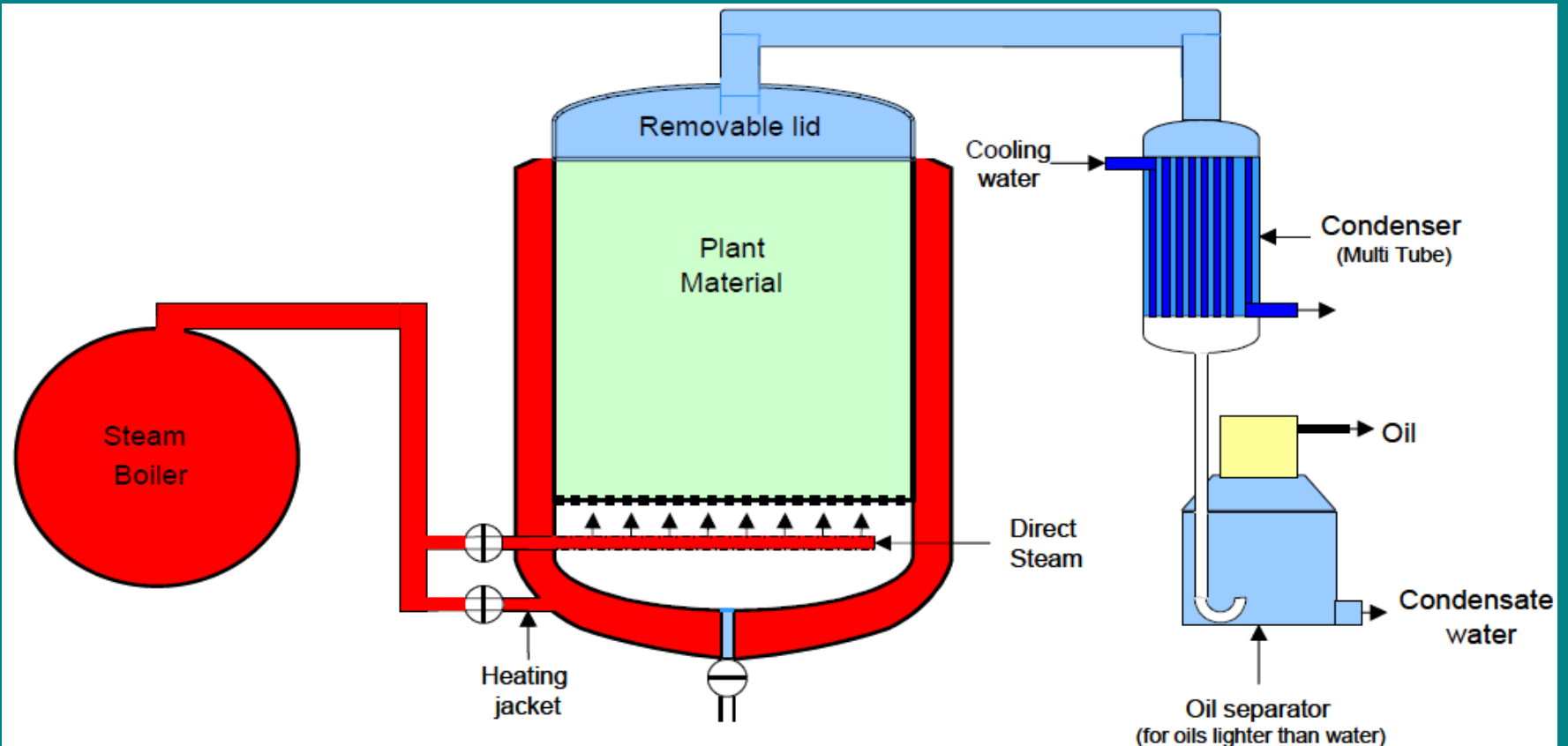
Potential Candidates of Direct Use in Jababeka & Karawang

No.	Company	Product	Temperature	Address	Phone
1.	PT. Unilever Indonesia Jababeka Factory	Food	100 °C	Jl Jababeka IX Kavling D-19, Cikarang Industrial Estate, Cikarang, Jawa Barat, Indonesia	021-8934453
2.	PT. Nestle Indonesia Karawang Factory	Food	100 °C	Kawasan Industri Surya Cipta Kav 1 No. 37, Jalan Surya Madya V. Kabupaten Karawang. Jawa Barat 41312	0267-8630353
				Kutamekar, Ciampel, Karawang Regency, Jawa Barat 41363 Indonesia	0267-440088
3.	PT. Ajinomoto Indonesia Karawang Factory	Food Additive	30 °C	Jalan harapan raya blok JJ no. 1 Sirnabaya, Telukjambe Timur, Kabupaten Karawang Jawa Barat 41361 Indonesia	021-89114141
4.	PT. Royal Industri Indonesia	Palm Oil	70-120 °C	Jalan surya utama, Kavling 1-4 Surya Cipta Industrial Estate Kabupaten karawang 41361 Indonesia	021-89115151
5.	PT. Yasulor Indonesia (L'oreal)	Hair Dye	70 °C	Kawasan Industri Jababeka 1 Jalan Jababeka IV blok V 10-33, 44-63. Cikarang Jawa Barat	Phone: 021-8714813 Fax: 021-8710217

*Estimate Temperature Hot Aquifer (West Java Sedimentary Basin): 95 – 165 °C

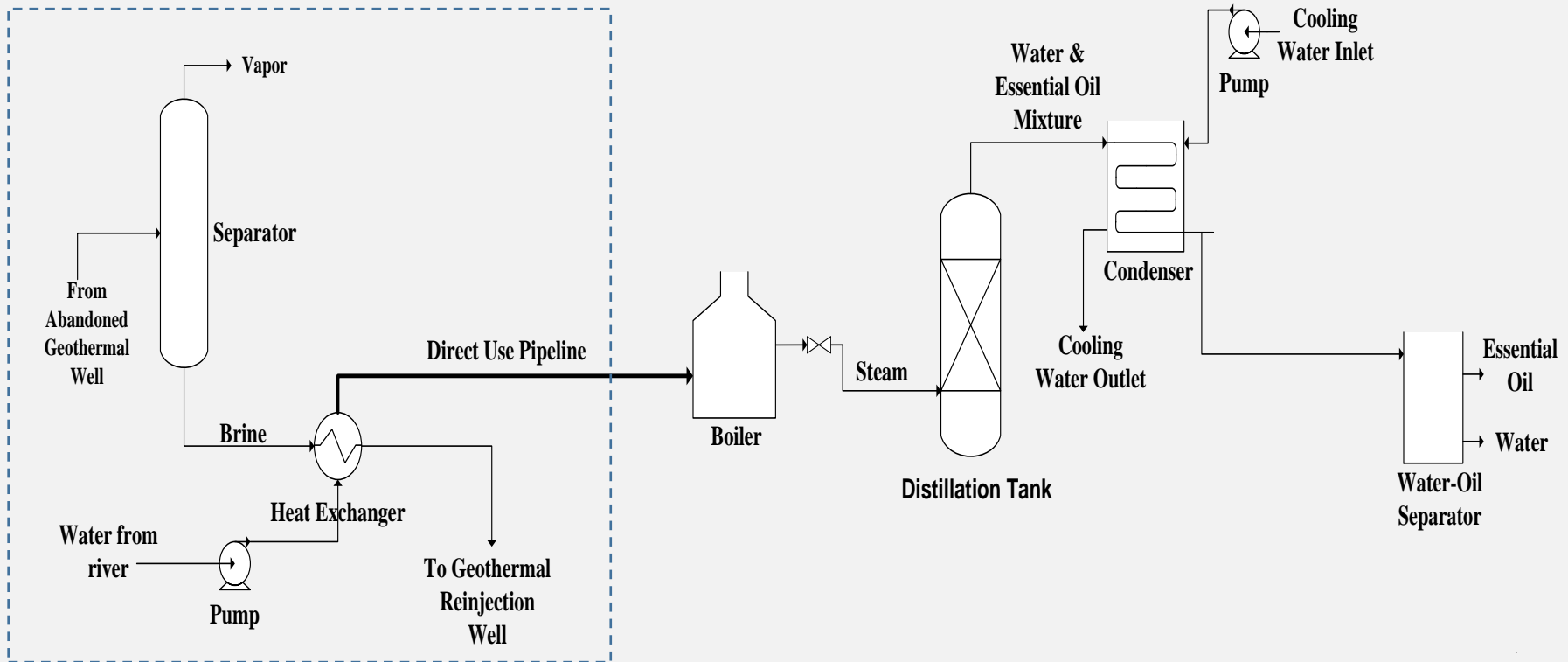


Vertiver Oil Process



Utilisation of waste heat in vertiver oil industry

Utilisation of waste heat



Vertiver Oil (Map)

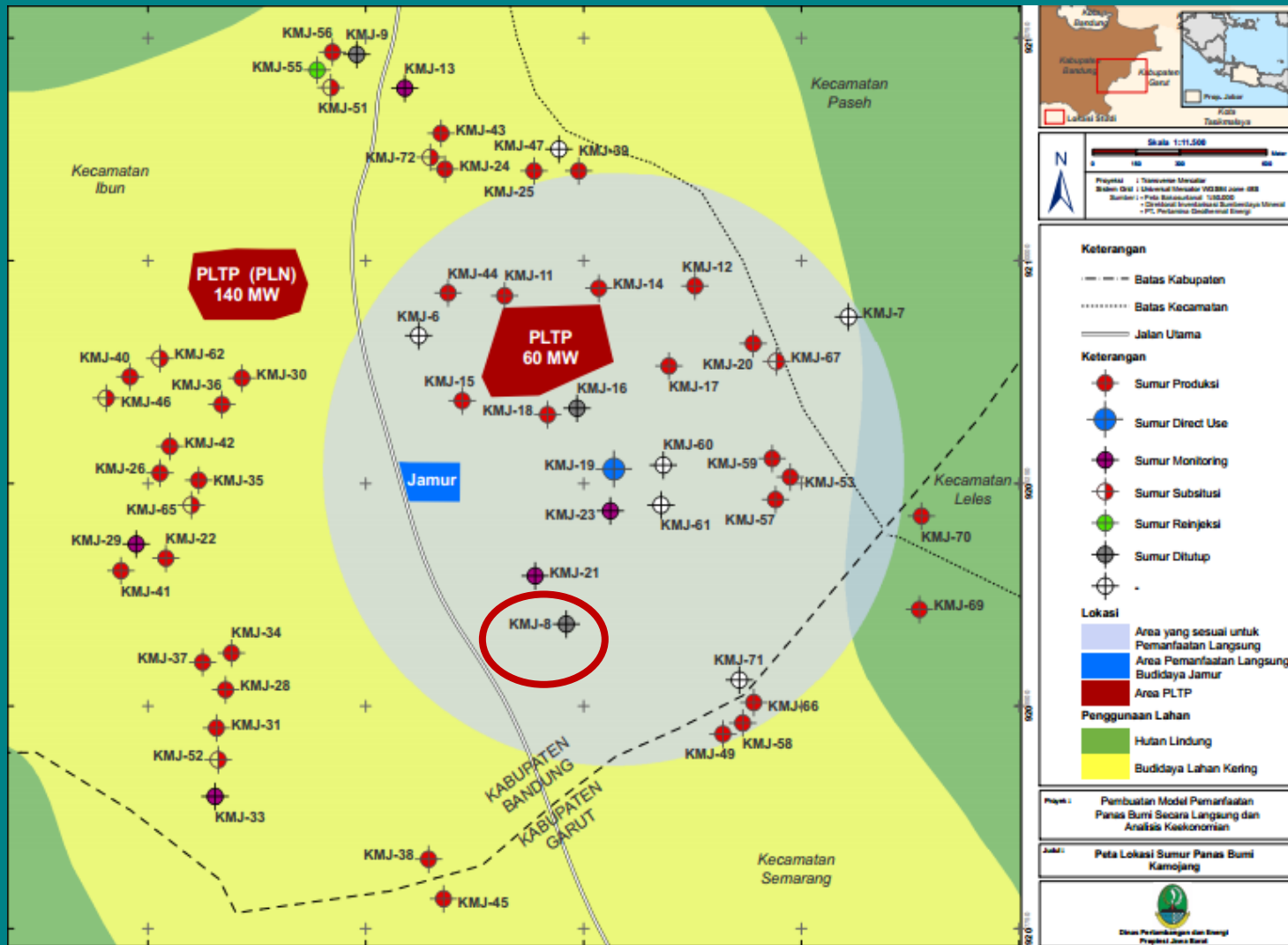


Waste heat utilisation obstacles in vertiver oil processing in Samarang, Garut

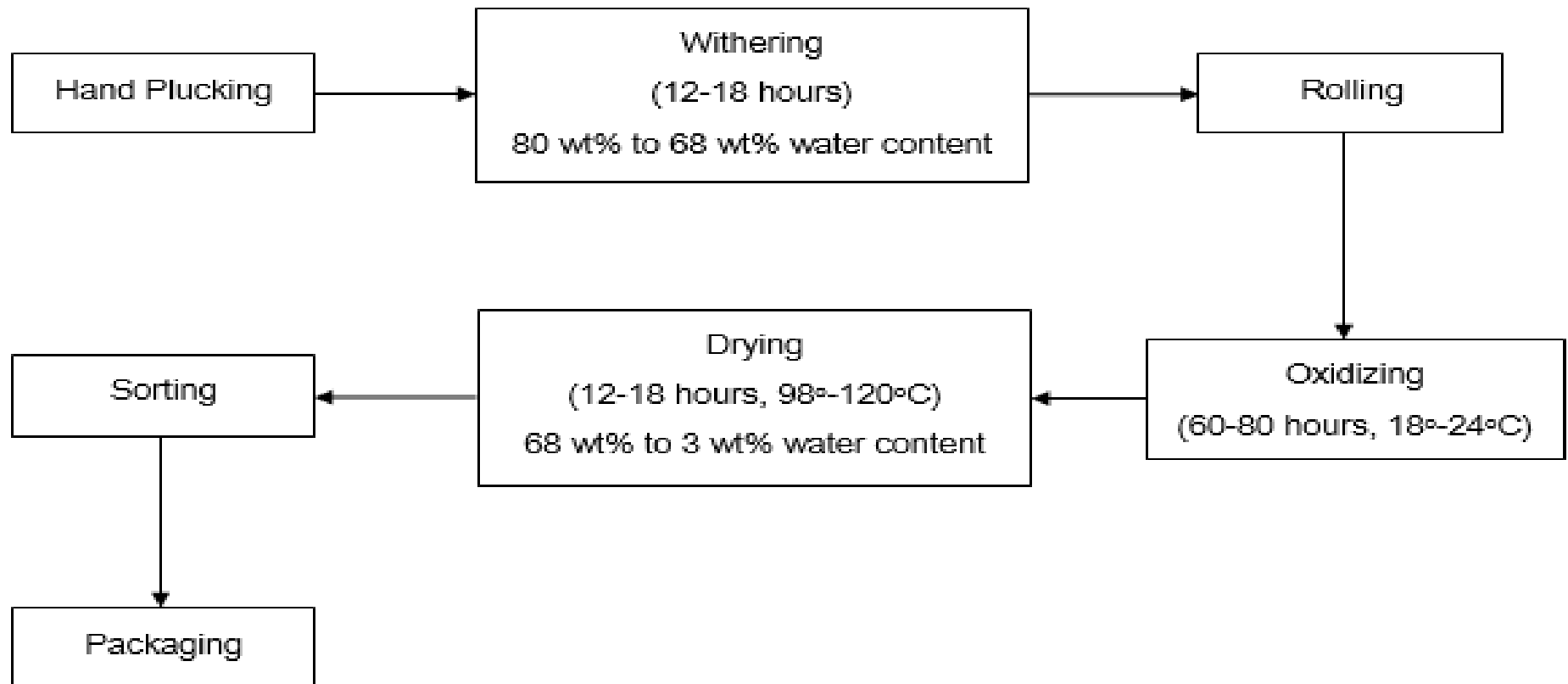
- Capacity 2 ton/bacth ~ 6 kg of vertiver oil. The operation is batch (intermittent) while the supply of heat is continuous
- Temperature level of heat source (condensate) is not high enough

Vertiver Oil (abandon well)

It needs heat source directly from abandon geothermal well because there is a problem in temperature level of Kamojang condensate near vertiver oil industry site

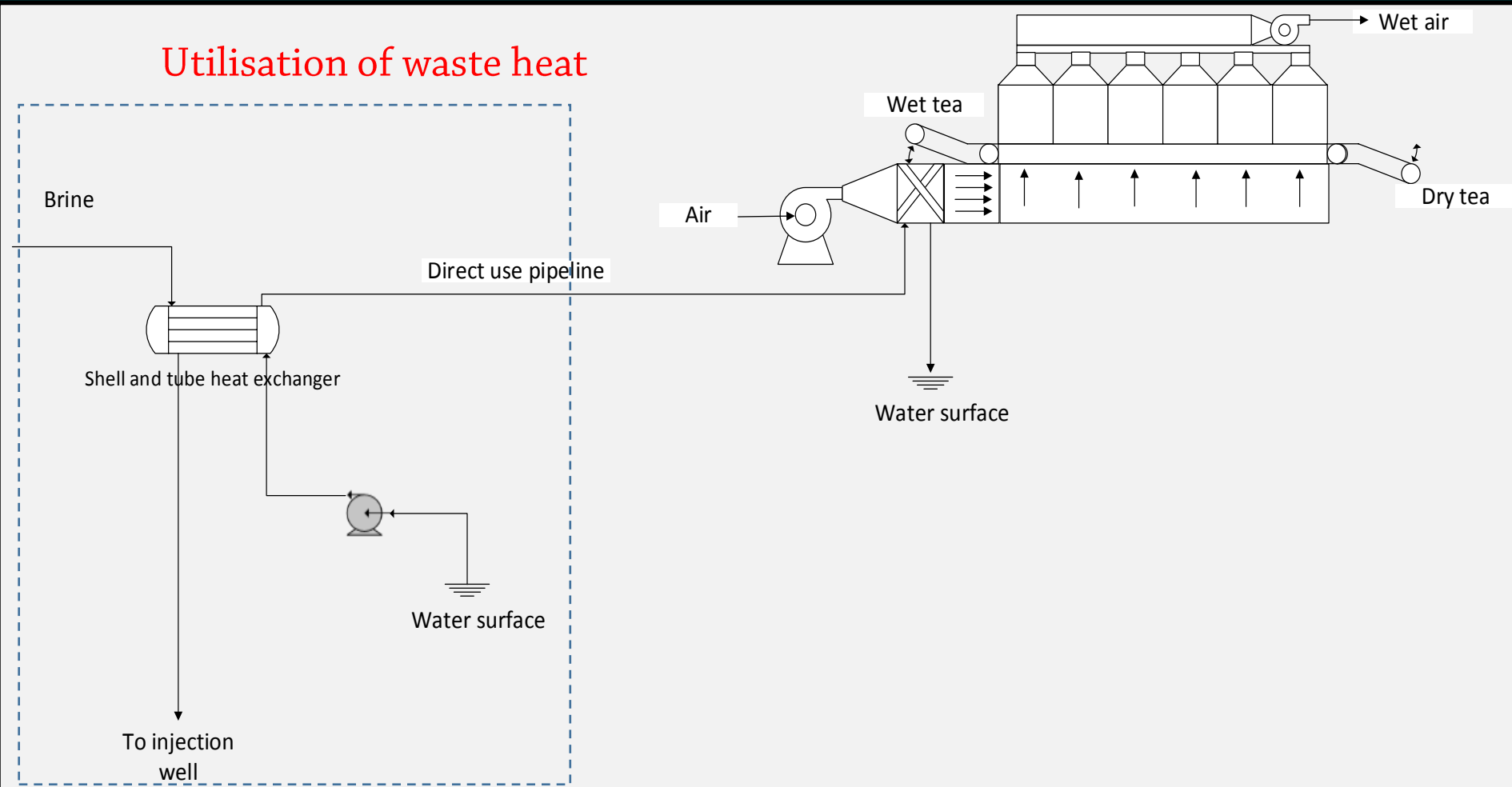


Tea Processing



Waste heat utilisation in Tea Drying

Utilisation of waste heat



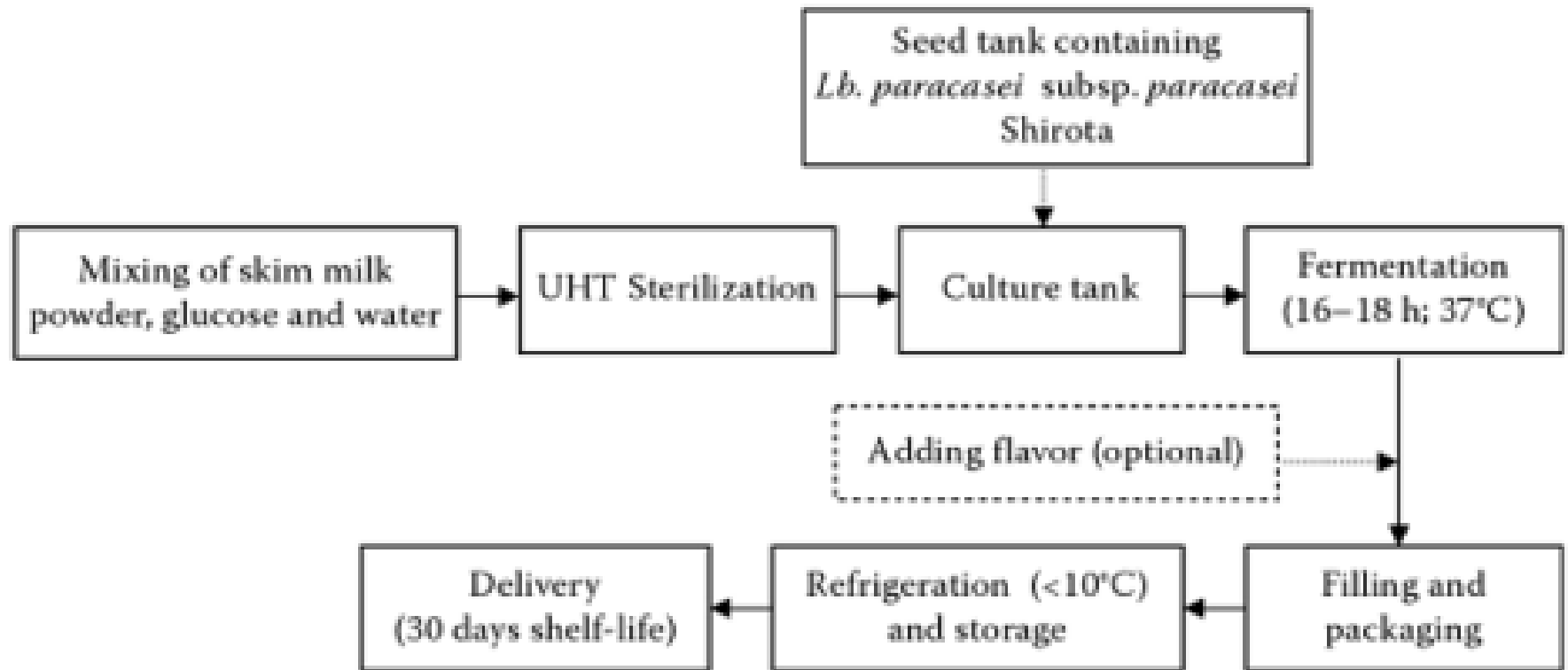
Tea Drying processing in PTPN VIII (Map)



Waste heat utilisation obstacles in PTPN VIII Tea Drying

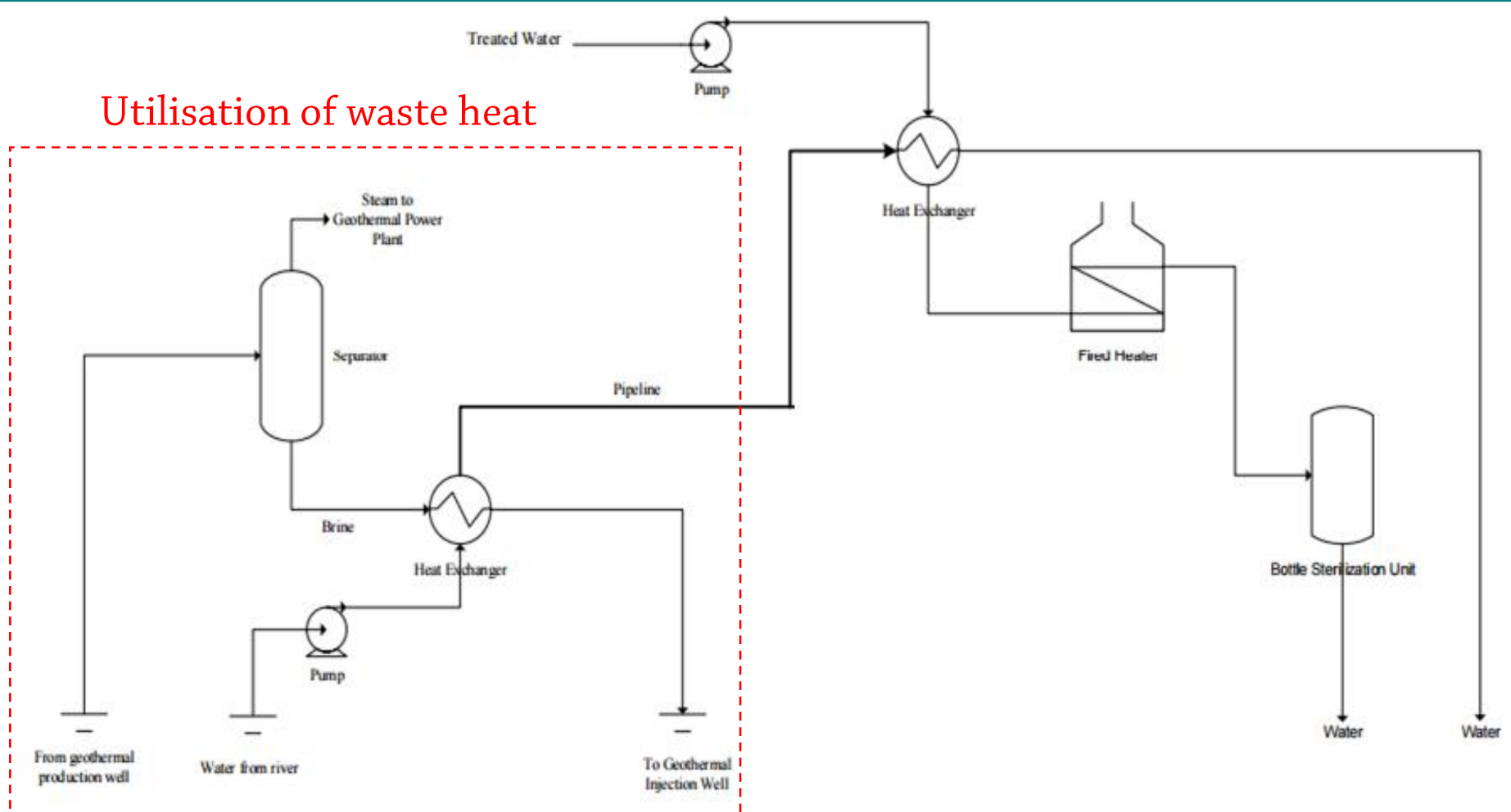
- Small capacity of tea drying so that steam pipe size is too small causing high heat loss
- Needs further information of Kertamanah unit

Fermented Milk Processing



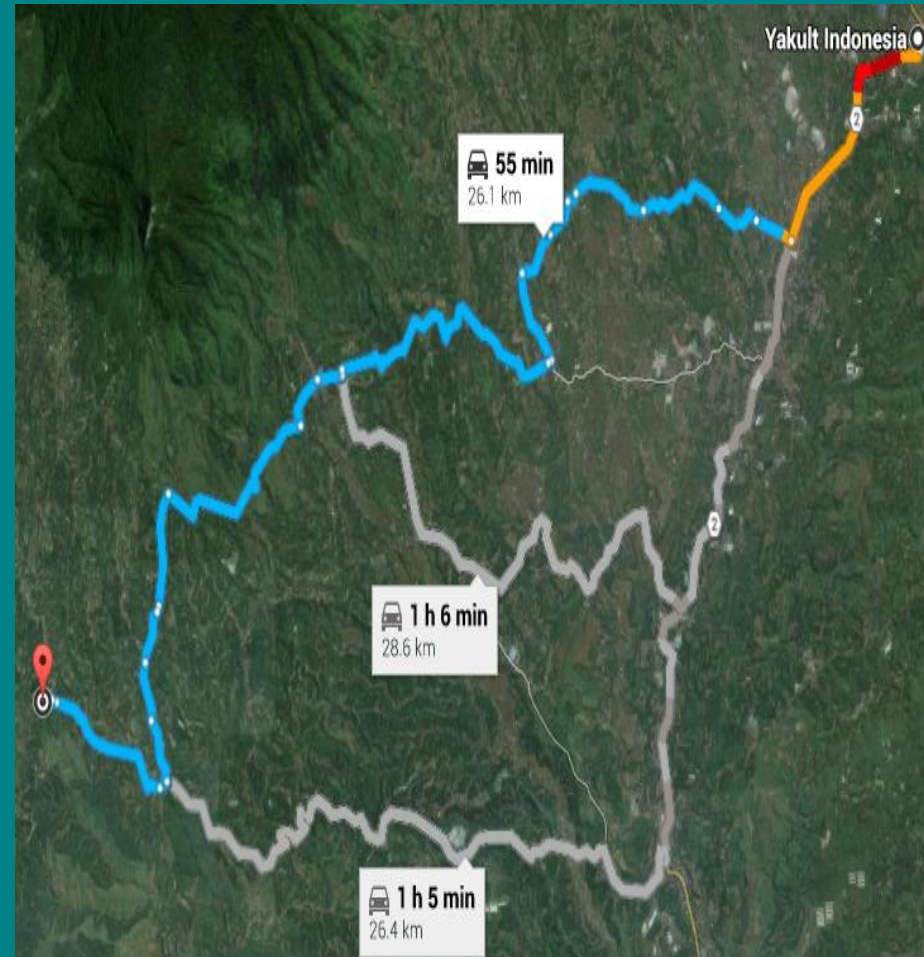
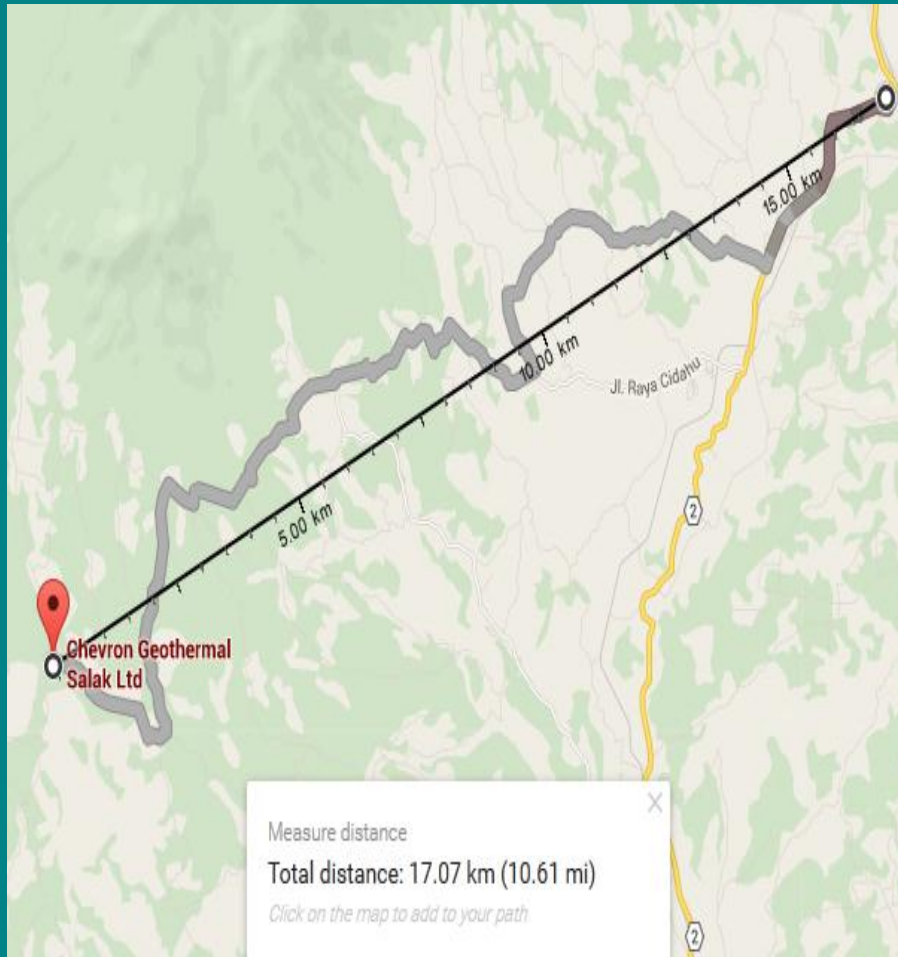
Waste heat utilisation for Milk Processing

Utilisation of waste heat



*We need to add a fire heater in milk industry to use geothermal waste heat as heat source

Softdrink company locations in Garut (Map)



Softdrink industry obstacles

- No access to interview the company candidates
- Level temperature of brine is not high enough
then fire heater should be added

Further Works & Obstacles

- The next step, to investigate more details of the potential candidates especially related to technical and economical assessments and feasibility analysis of selected candidates.
- There are difficulties to get access for interviews with some potential candidates. Administration barriers should be resolved.

Thank you

