

# Urban Mined Olympic Medal as a Legacy for Sustainable Society

Kohmei HALADA

Urban mined Olympic medals





## Medals for 2020 Tokyo Olympics to be made of recycled metal

AP 2:06 a.m. ET April 1, 2017



(Photo: The Associated Press)



TOKYO (AP) — Organizers of the 2020 Tokyo Olympics have begun collecting discarded electronic devices that will be used in the production of the medals to be awarded to athletes.

Japanese Olympic swimmer Takeshi Matsuda and Paralympian Takuro Yamada attended a ceremony in downtown Tokyo on Saturday to kick off the campaign.

Die Welt neu entde





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**SPORTS NEWS** | Wed Feb 1, 2017 | 5:28am EST

# Tokyo Olympic medals to be made from recycled donated metal



FILE PHOTO: A woman is silhouetted against a monitor showing Tokyo 2020 Olympics and Paralympics emblems during the Olympic and Paralympic flag-raising ceremony at Tokyo Metropolitan Government Building in Tokyo, Japan, September 21, 2016. REUTERS/Toru Hanai/File Photo

2020 Tokyo Olympic is  
in preparation



# Dream Island just after Tokyo Olympic 1964.

Deposit site of waste from mass consumption

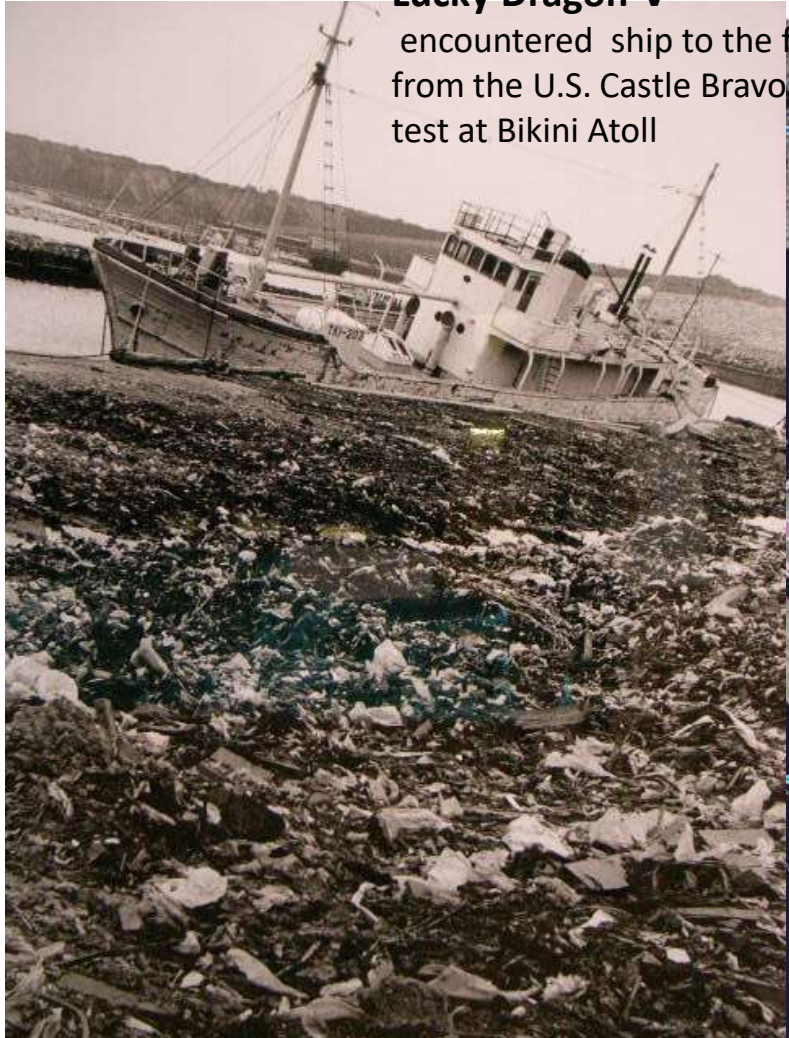


We fought against  
fly.



# Waste landfill area of Tokyo in late 20th century.

**Lucky Dragon-V**  
encountered ship to the fallout  
from the U.S. Castle Bravo nuclear  
test at Bikini Atoll



(資料提供：東京都港灣局)

We construct Olympic stadiums  
in this area.



Olympic becomes a symbol  
from  
Economic growth 成長  
to  
Mature society 成熟

**Global material management  
should change to be  
from Economic growth  
to mature society of sustainability**





Three mayors in Tohoku-area , Hachinohe, Ohdate, Ichinoseki, proposed JOC at first.

えっ！携帯電話から  
金メダル？

あなたの家に眠っている  
使用済小型家電の回収にご協力下さい。

使用済みの携帯電話やデジタルカメラ、ノートパソコンなどの小型家電には、金、銀、銅、レアメタルなどの有用金属が多く含まれています。  
東北地方で小型家電リサイクルの認定事業者がある青森県八戸市、秋田県大館市、岩手県一関市では、使用済小型家電から回収された金属を2020年東京オリンピック・パラリンピックのメダルに活用することや、環境技術大会経費委員会や関係者等に共同で提案しています。  
\*使用済小型家電をゴミとして処分せず、再作の資源回収にご協力いただき、市民の皆様と協力での回収を推進させ、日本のリサイクル技術の進歩と発展に貢献したい大会をPRしましょう！

**使用済小型家電で  
金メダルを作ろう!!**

協賛先  
八戸市  
大館市  
一関市

八戸、大館、一関の三市提案

「2020年東京オリンピック・パラリンピックのメダルに回収金属を活用することについての提案」

のフィージビリティに関する調査報告

Ecomaterial Forum

Followed the feasibility background.

2016年1月11日

未踏科学技術協会・エコマテリアルフォーラム(会長:原田幸明)

〒105-0003 東京都港区西新橋1-5-10 新橋アマノビル6F

(社)未踏科学技術協会

(窓口) 田口 Tel: 029-859-2668

メール: [ecomaterial@sntt.or.jp](mailto:ecomaterial@sntt.or.jp)



# 都市鉱山メダル連携促進委員会 発足式

小型家電リサイクル「みんなで集めて、メダルをつくろう！」



中村直也

原田幸明

黒田武志

岡村秀人

谷岡郁子

吉田沙保里

川井梨紗子

登坂絵莉

土性沙羅

栄和人



## Olympic Charter (-2000)

### ***BYE-LAW TO RULE 70***

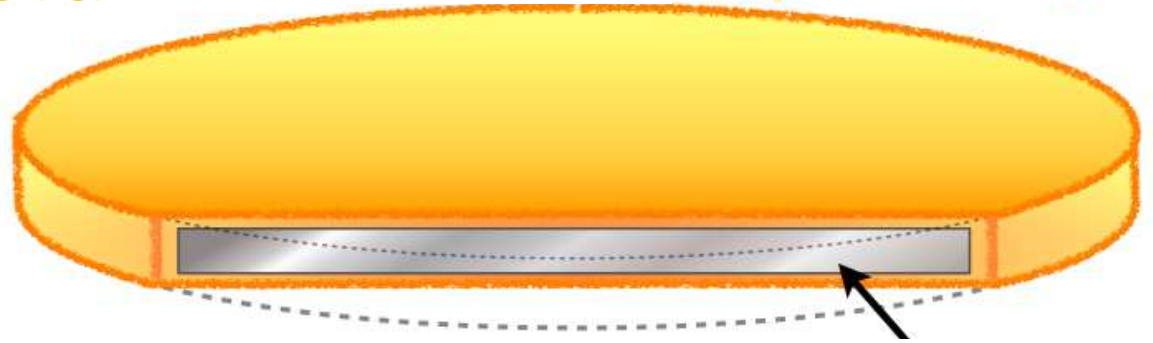
#### 2- Medals and Diplomas

2.2 the medals shall be at least 60mm in diameter and 3mm thick. The medals for first and second places shall be of silver of at least 925-1000 grade; the medal for first place shall be gilded with at least 6g of pure gold.

Weight  
95 ~ 500g

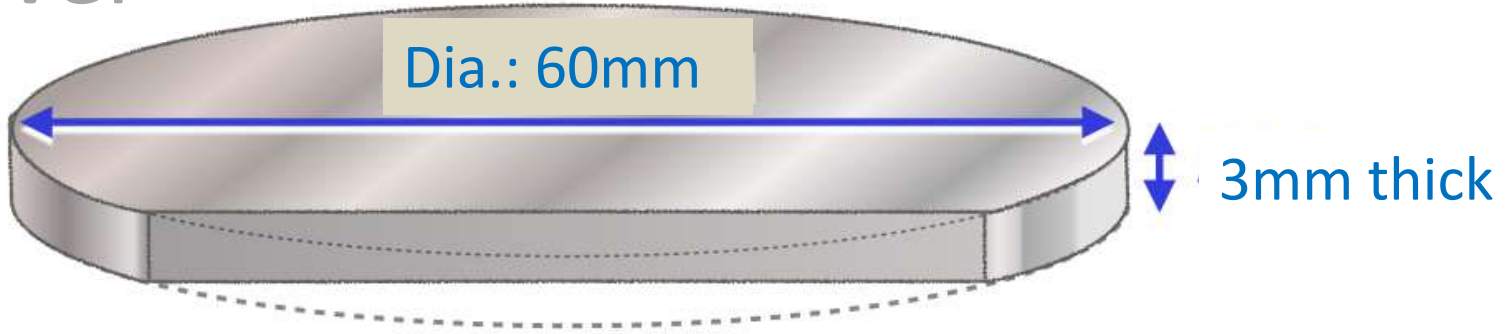
gold

Gold plated 50 $\mu$ m 6 g

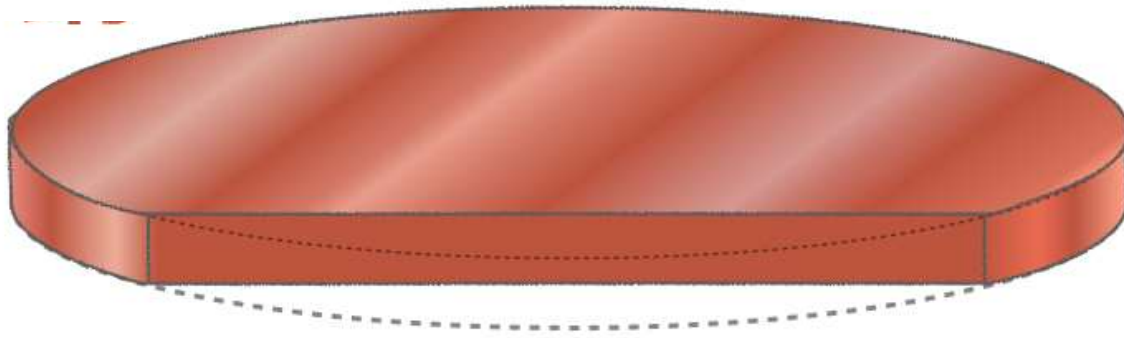


silver

Base consists of Silver



bronze



	Vancouver 2010	London 2012	Rio 2016
gold	Recycled content (1.11%)	Obtained from sustainable mining	extracted without the use of mercury
silver	Recycled content (0.12%)	Not mentioned	Recycled content 30%
broze	Recycled content (1.52%)	Zinc in bronze was partially recycled	Recycled content 30%

# How much metals are required for Olympic medals

	London 2012		Olympic Charter 2000				
	Olympic	Paralympic	Au	Ag	Cu	Zn	Sn
Gold	659	675	6	379	25	0	0
Silver	649	670	0	381	29	0	0
Bronze	702	687	0	0	368.5	9.5	2
Total	2010	2032	<b>9.6kg</b>	<b>1,210kg</b>	<b>700kg</b>		



# Urban mining in Japan

# Recycled raw material percentage in Japan

	2014			2025		
	Recycled (t)	produced (t)	recycled %	Recycled (t)	produced (t)	recycled %
Au	29.2	106.8	27.3%	31.7	113.8	27.8%
Ag	731	1803	40.5%	817	1967	41.5%
Cu	254000	1538000	16.5%	253000	1509000	16.8%
Pb	114000	200000	57.0%			
Zn	125000	589000	21.2%			

Data from Japan Mining Association

## Electric households contain a great amount of metals

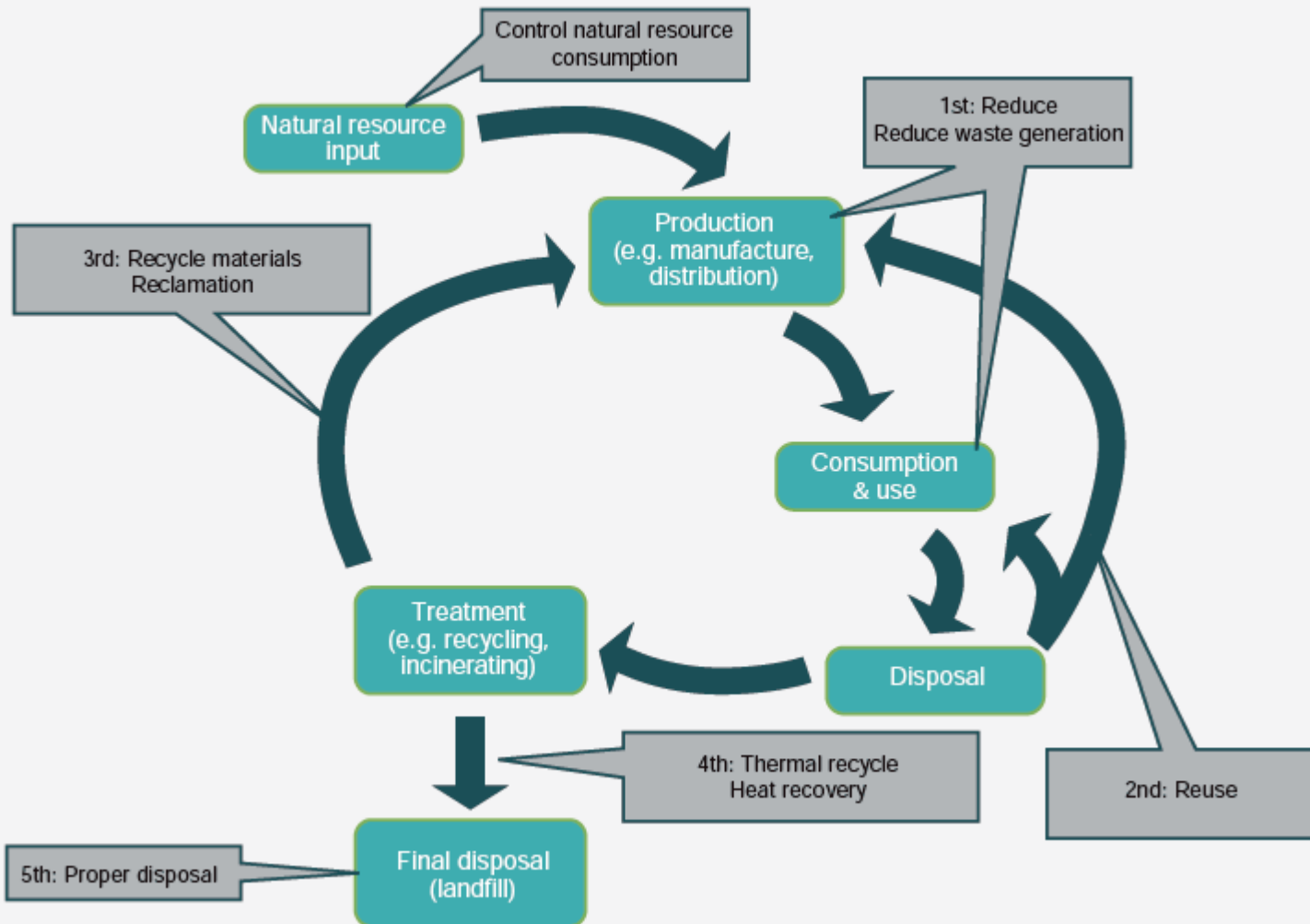
	BD player	Cell phone	PC laptop	PC disctop
Per equipment	3.6kg	0.1kg	2.1kg	8.2kg
Discarded at 2011	60,000	40,000,000	6,700,000	5,000,000
Annual amount	211t	5600t	1400t	4000t
gols	3kg	1,900kg	2,000kg	2,500kg
silver	16kg	10,000kg	5.600kg	15,000kg
copper	4800t	510,000t	550t	2,200t

## Amount of recycled metal by the law of small size electric households rcycling

	2013	2014	2015	Requisite for Olympic medals
Au	46kg	<b>143kg</b>	<b>214kg</b>	<b>9.8kg</b>
Ag	446kg	<b>1566kg</b>	<b>2563kg</b>	<b>1210kg</b>
Cu	381ton	<b>1,112ton</b>	<b>1469ton</b>	<b>700kg</b>

# 3Rs in Sound material-cycle society

Figure 3-1 Flowchart for a sound material-cycle society



Source: Ministry of the Environment

Regulations according to characteristics of individual articles

Law for the Promotion of Sorted Collection and Recycling of Containers and Packaging

Completely enforced in April 2000  
Partially amended in June 2006

- Sorted collection of containers and packages by municipalities
- Recycling by container manufacturers and business operators who use containers and packages

e.g. bottles, PET bottles, paper or plastic containers and packages

Law for the Recycling of Specified Kinds of Home Appliances

Completely enforced in April 2001

- Retailers, etc. collect waste electric appliances from consumers
- Recycling by manufacturers, etc.

Air conditioners, refrigerators & freezers, TVs, washing machines

Law for the Promotion of the Utilization of Recyclable Food Resources

Completely enforced in May 2001  
Partially amended in June 2007

- Recycling of commercial food waste by food manufacturers, processors, and retailers

Food residues

Construction Materials Recycling Law

Completely enforced in May 2002

- Sorted demolition, etc. of buildings
- Recycling of construction waste materials, etc., by contractors

Timber, concrete, asphalt

Law for the Recycling of End-of-Life Vehicles

Partially enforced in January 2003  
Completely enforced in January 2005

- Collection of used vehicles, collection of CFC gas, demolition, and crushing by concerned business operators
- Recycling of airbag shredder dust, and destruction of CFCs by manufacturers

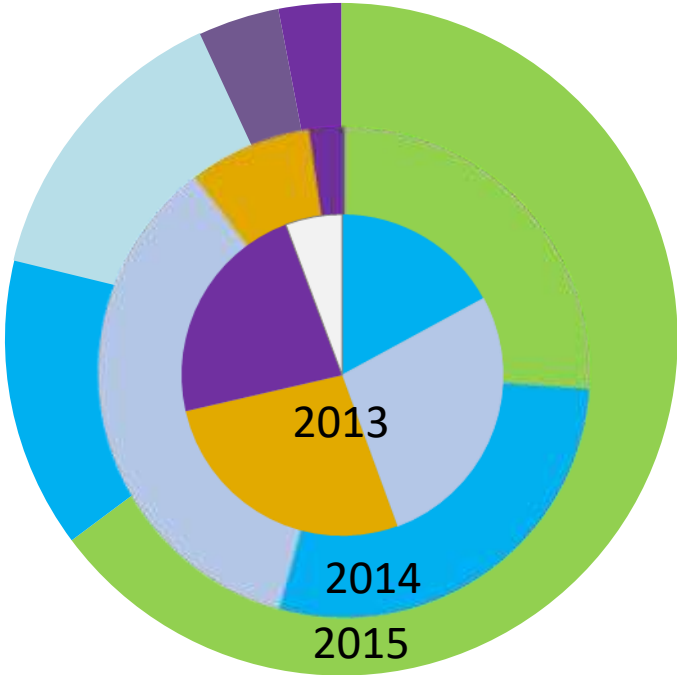
Vehicles

Completely enforced in April 2001

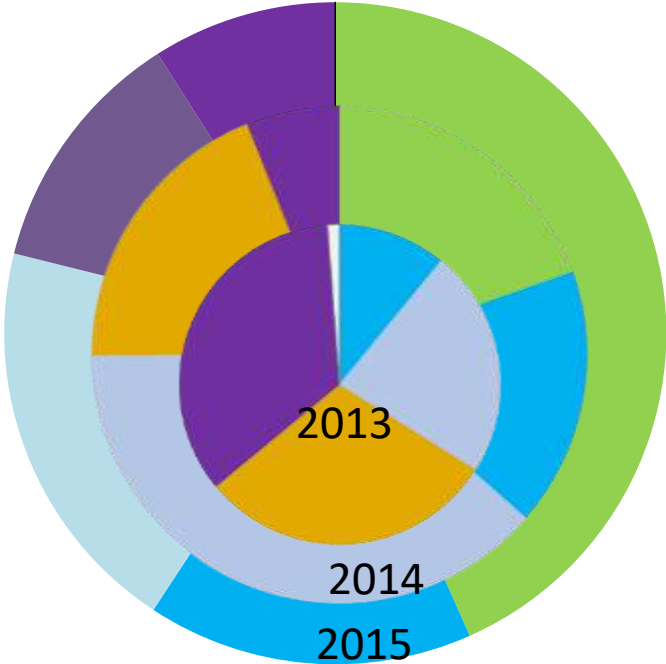
Law concerning the Promotion of Procurement of Eco-Friendly Goods and Services by the State and Other Entities  
(The State and other entities take the initiative to promote the procurement of recycled items)



**%of local government population**



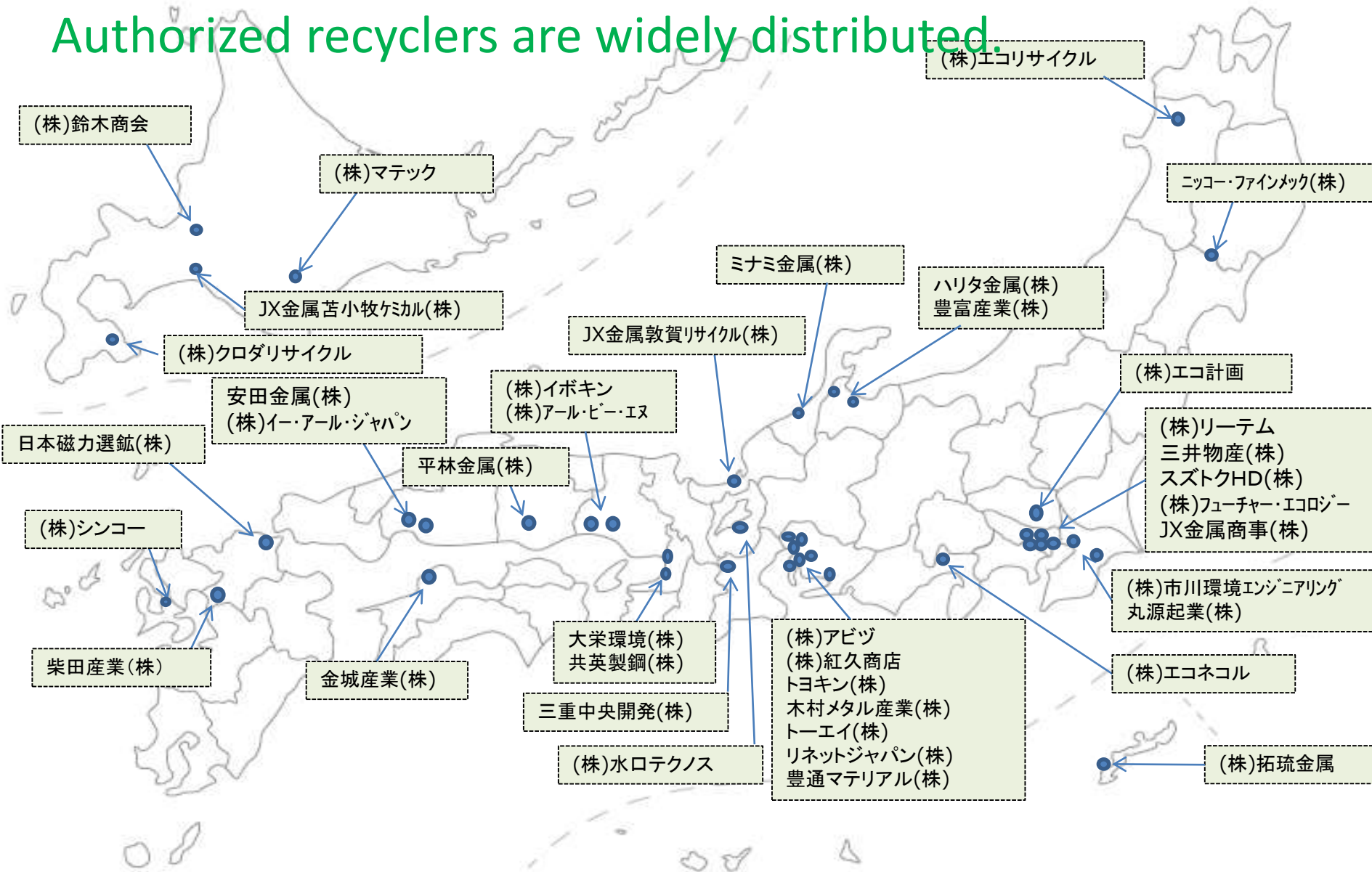
**%of local government in number**



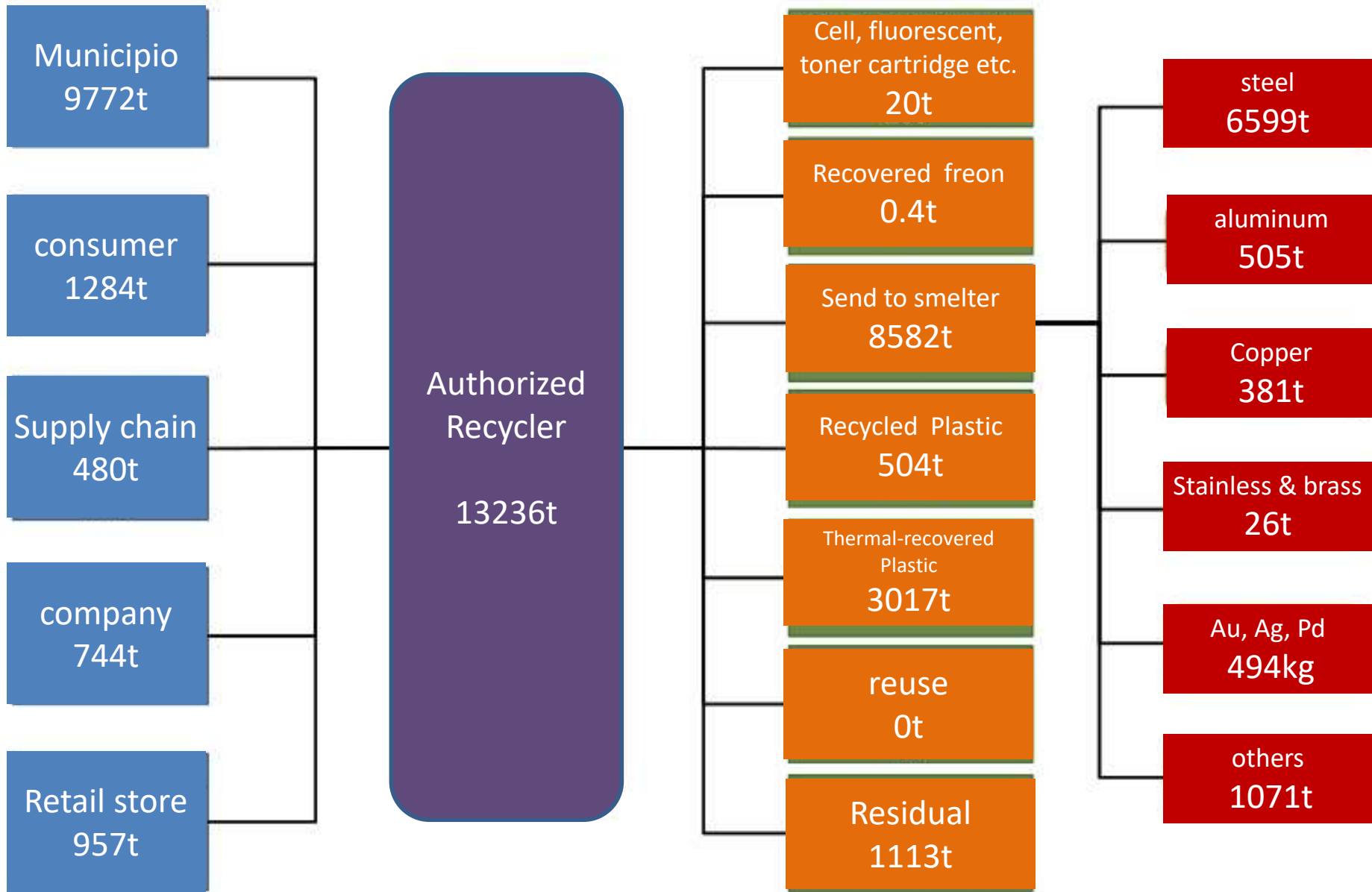
- in operation
- in preparation
- forward-looking
- passive stance
- rejection
- no answer

# 認定事業者の分布状況（平成27年6月末現在）

Authorized recyclers are widely distributed.



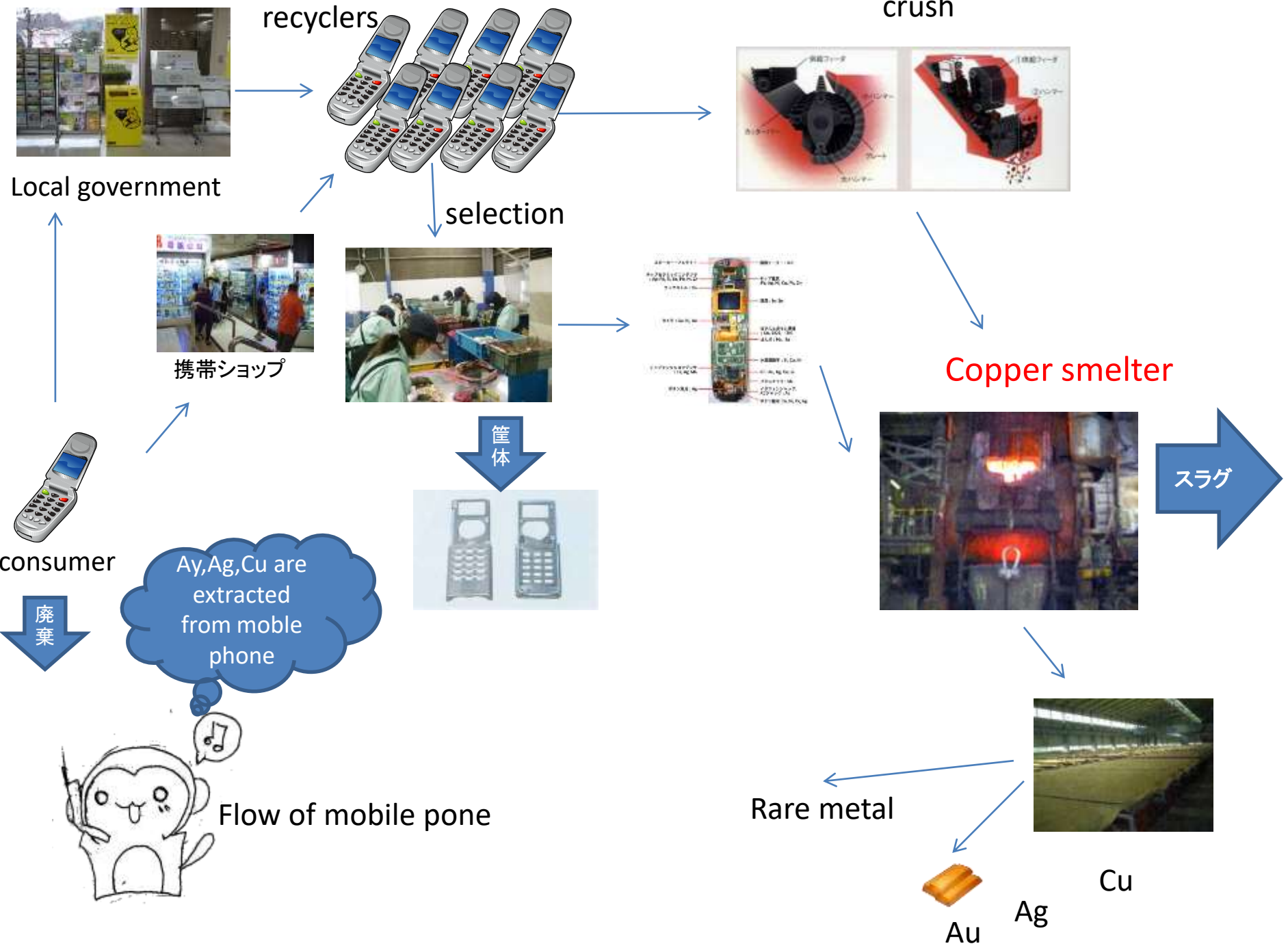




# Recovery of Gold from Urban mine

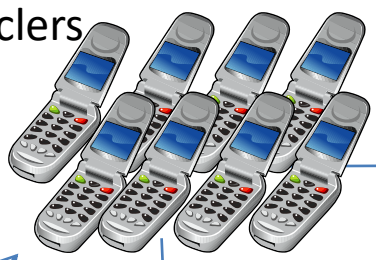


コンピュータなどの電子基板です



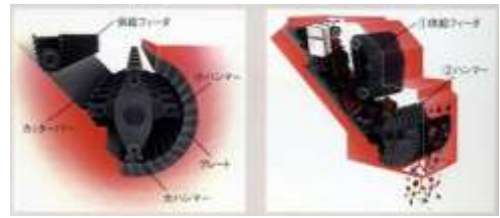
Local government

recyclers



selection

crush



携帯ショップ



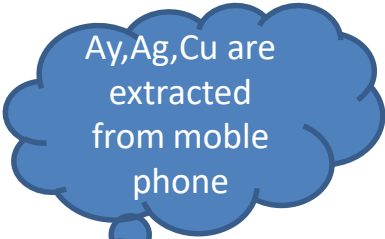
筐体



Copper smelter



consumer



Flow of mobile phone

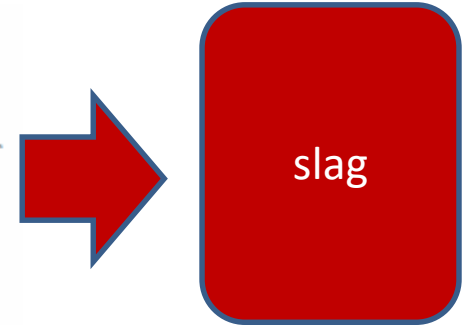
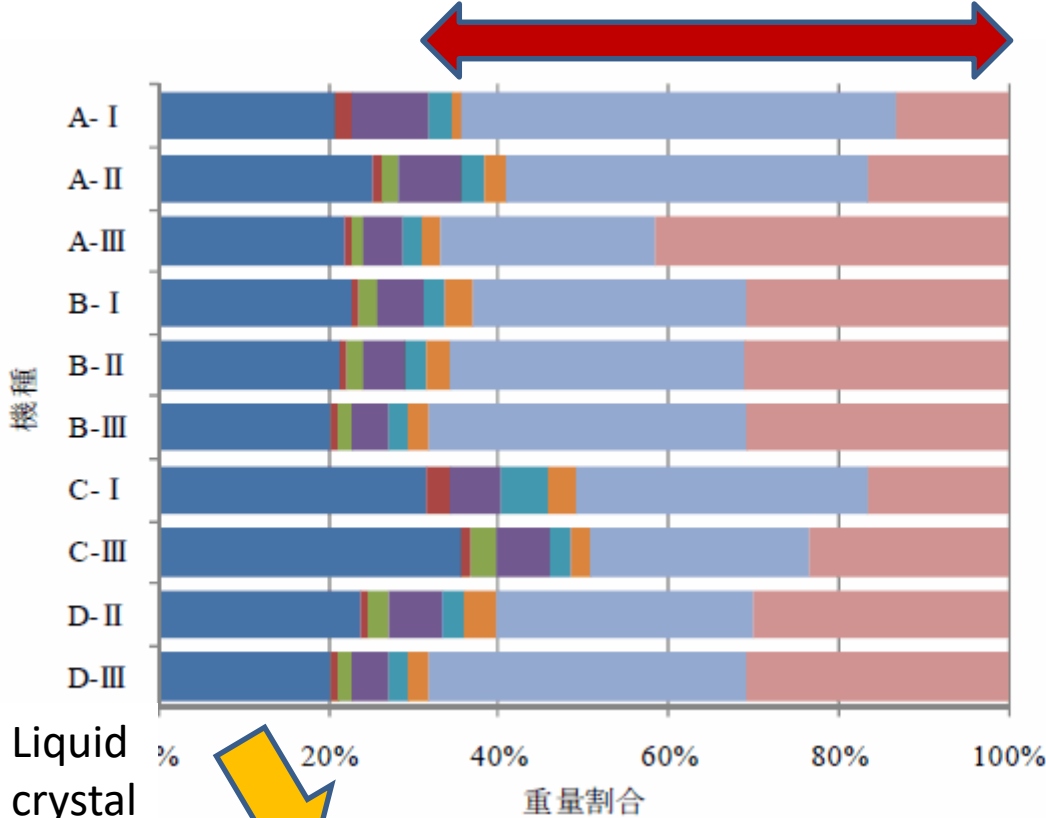


Rare metal

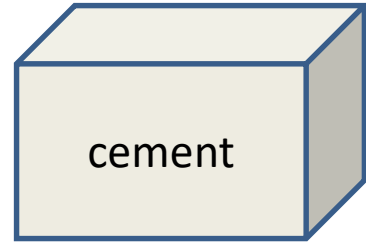
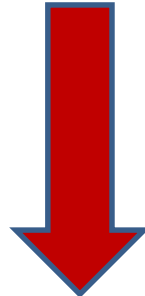


Ag

Cu



More than 90%



Less than 10%

Liquid crystal

元素	2000-2002年
Ag	A-1
Al	1~5
As	
Au	
B	1~5
Ba	0.5~3
Ca	0.5~3
Cr	
Cu	0.01~0.1
Fe	
In	0.01~0.1
Mg	0.1~1
Mn	
Mo	
Ni	
Sb	
Si	10~30
Sr	
Ti	0.005~0.05
W	
Zn	

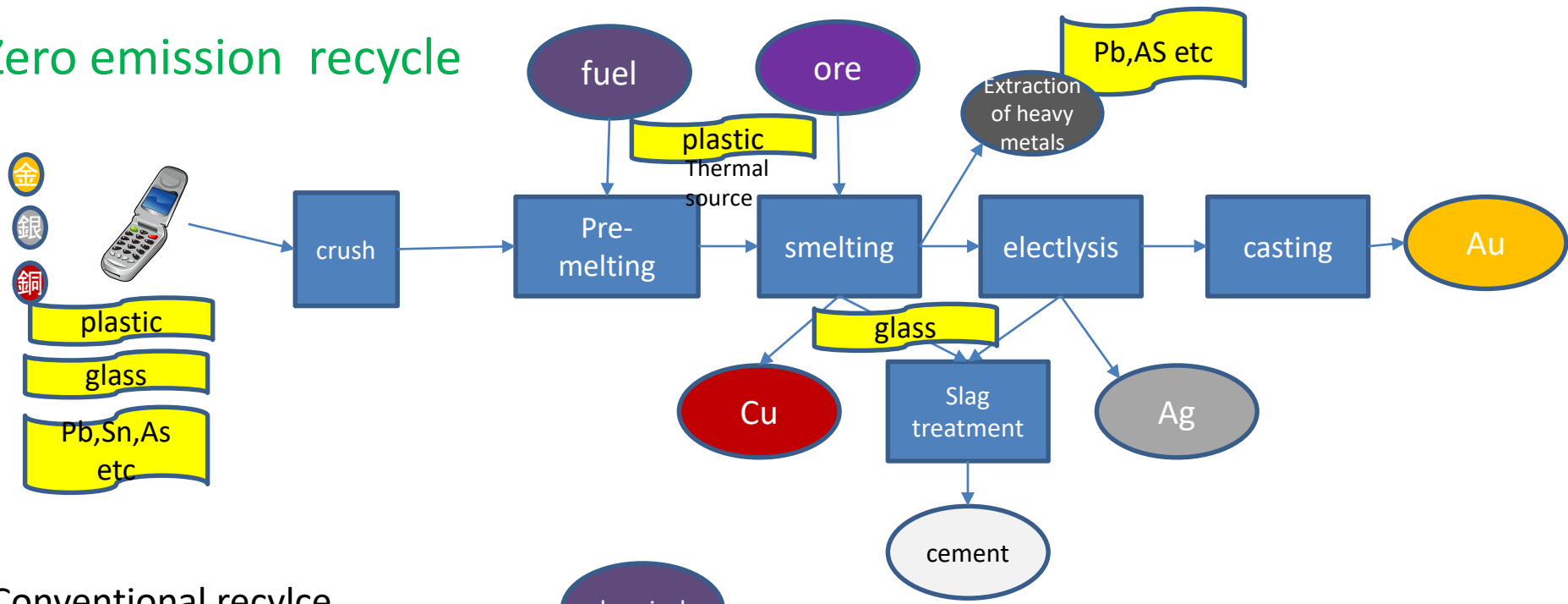
Circuit board

基板	A-1
元素	2000-2002年
Ag	0.262
Au	0.113
Co	0.031
Cu	25.7
Dy	0.014
In	0.008
Nd	0.112
Pd	0.012
Sm	<0.01
Ta	0.180
W	0.132

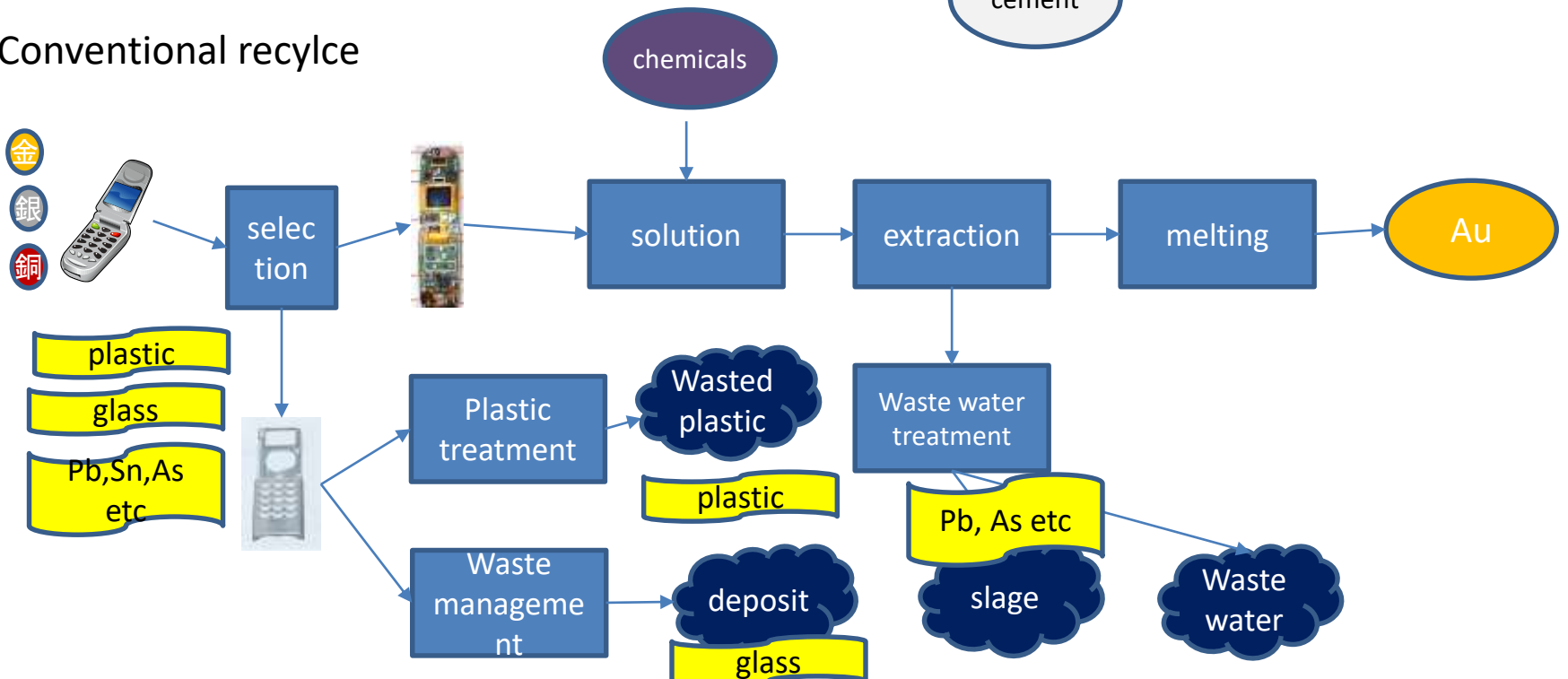
Ag 0.05%  
Au 0.02%  
Co 0.06%  
Cu 5%  
Dy 0.003%  
In 0.0015%  
Nd 0.02%  
Ta 0.04%  
W 0.025%



# Zero emission recycle

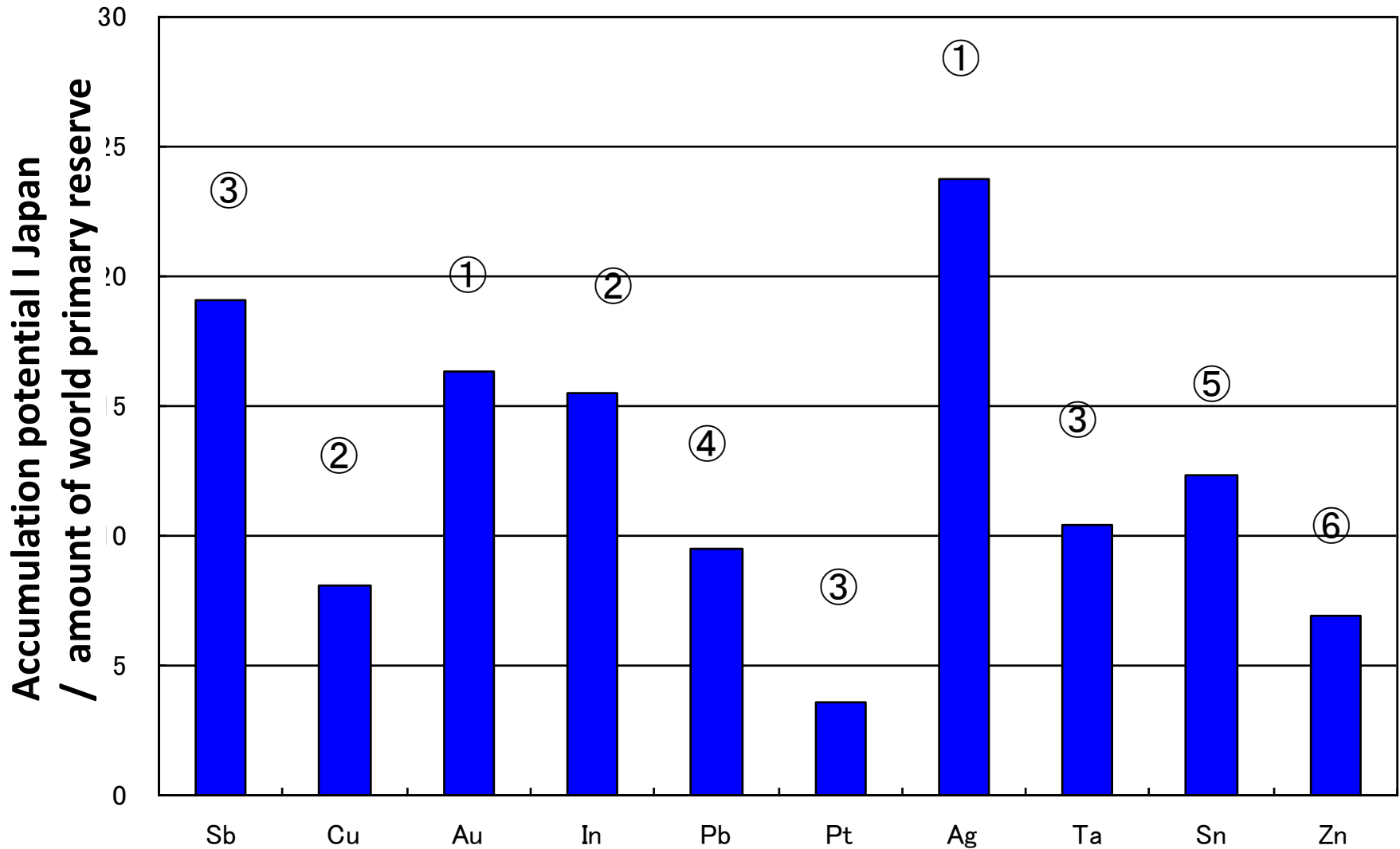


# Conventional recycle



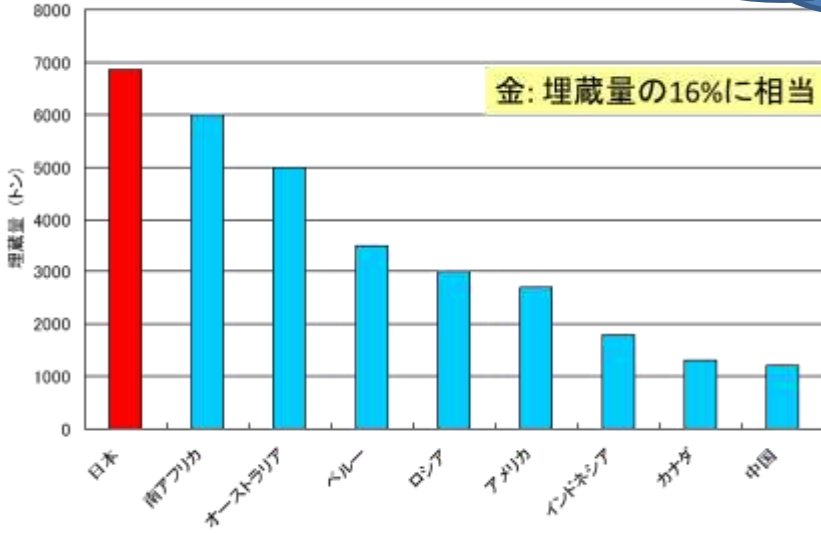
# Urban mining

# Potential of urban mine is nearly as great as reserves of resource countries.



日本には資源ないてない  
とってた

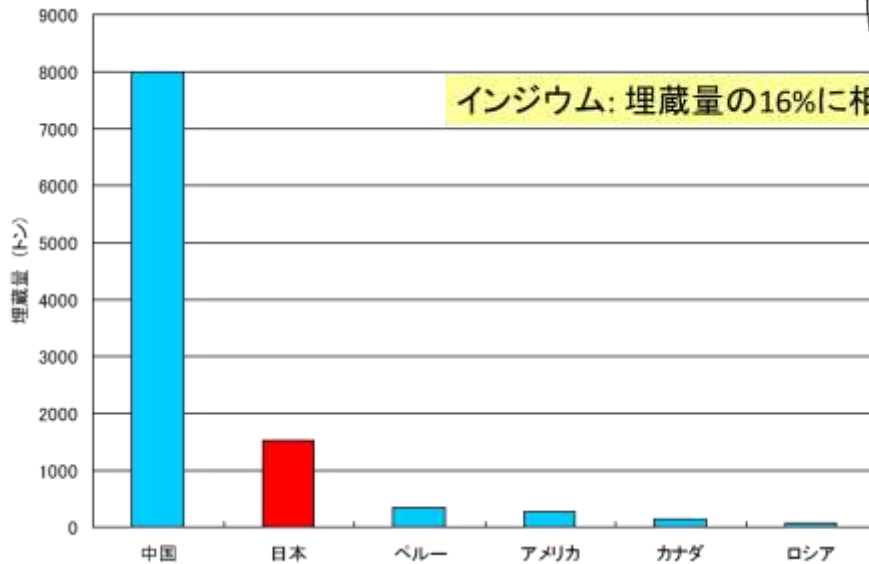
金: 埋蔵量の16%に相当



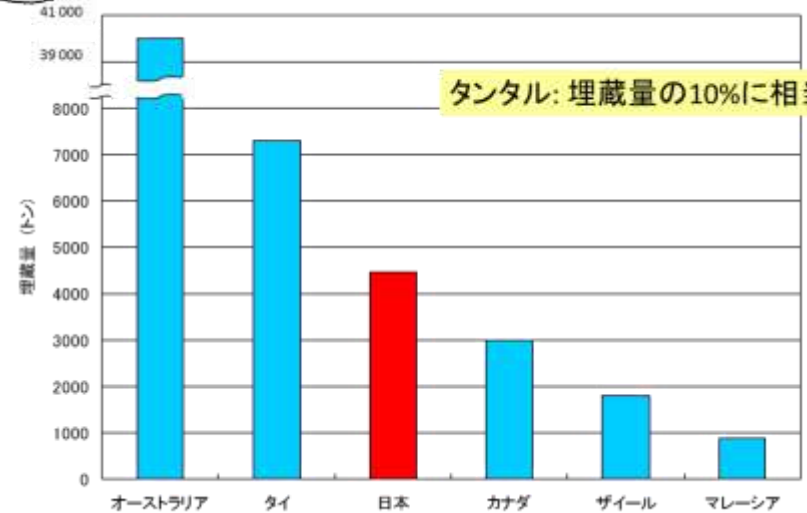
銀: 埋蔵量の23%に相当



インジウム: 埋蔵量の16%に相当

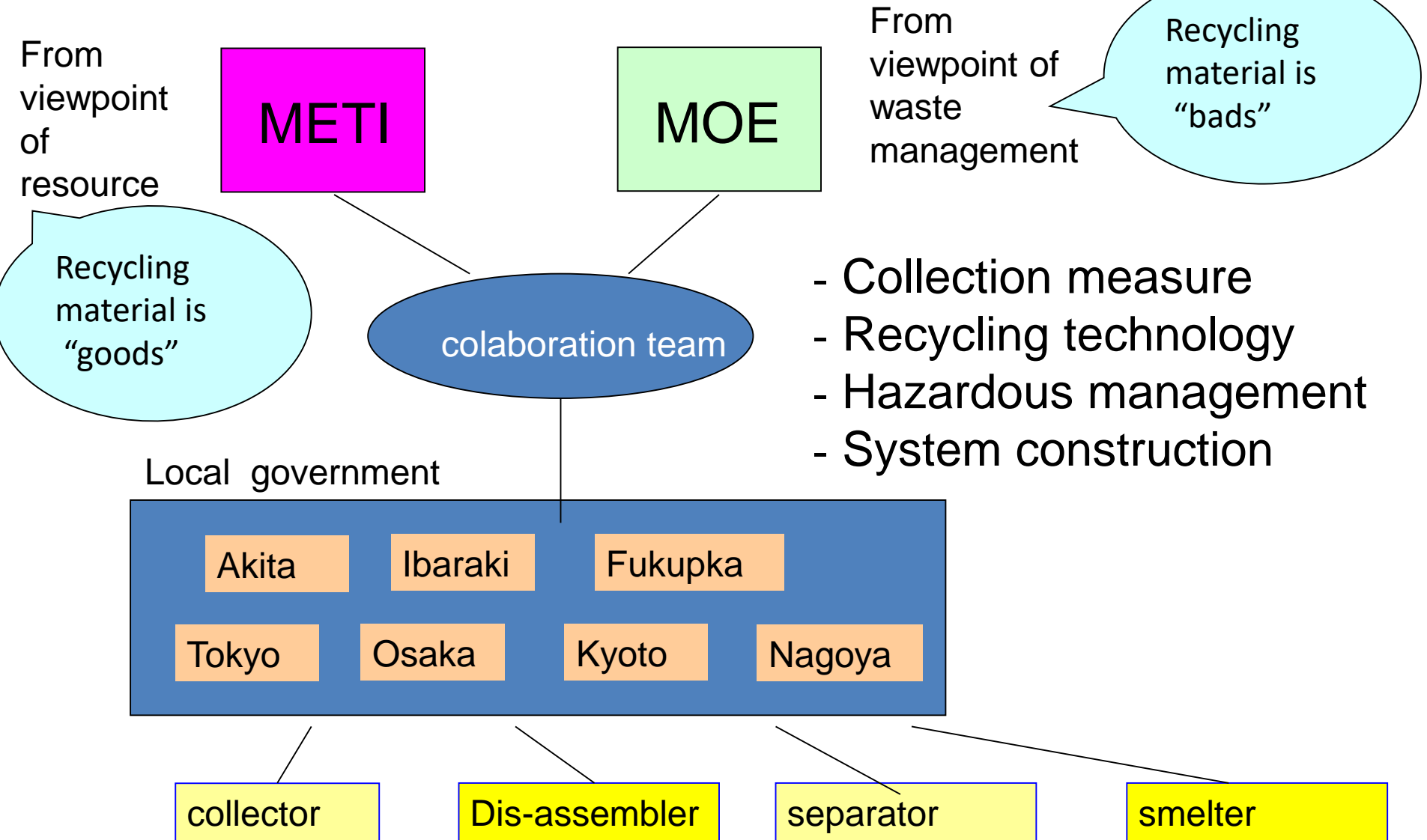


タンタル: 埋蔵量の10%に相当





# Colaboration team since 2008



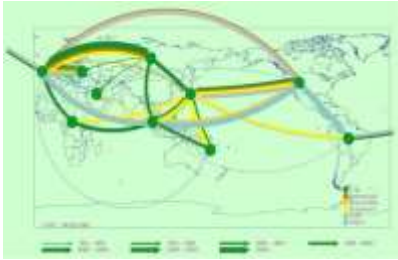
Composition analysis	Total EoL		Municipally Collected		Municipal Final disposal		
	Weight (ton)	Price (M¥)	Weight (ton)	Price (M¥)	Weight (ton)	Price (M¥)	
Practical waste management investigation	Fe	185,668	5,570	67,451	2,024	24,671	735
	Cu	25,525	893	10,749	376	7,905	264
	Al	17,820	13,552	6,414	4,878	5,719	4,349
	Pb	613	155	164	41	157	40
	Zn	543	125	135	32	129	30
	Ag	44	3,989	12	1,121	12	1,098
	Au	9	31,926	2	7,830	2	7,649
	Sb	90	125	26	37	26	36
	Ta	29	4,567	8	1,233	8	1,212
	Nd	7	57	2	14	2	14
	W	6	45	2	12	1	12
	Co	5	19	1	5	1	5
	Bi	5	10	1	3	1	3
	Pd	3	6,405	1	1,467	1	1,448
sum	230,357	67,438	84,968	19,071	38,635	16,899	

¥17Billion is disposed in municipal waste management

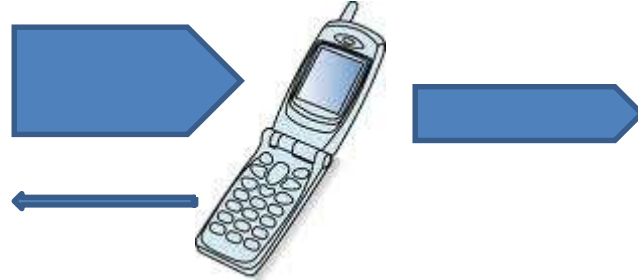


# Route of small size electric appliance recycle

① correct resource from world



② High-tech manufactures ③ produce high-tech products



④ local governments collect EOLs

⑧ it should be circulated!!!



⑦ smelt to metal



⑥ separate



⑤ dismantle



⑨ sold in the market

# Collection methods

## box



回収ボックスを公共施設や商業施設等に常設し、排出者が直接投入した物を定期的に回収する手法

## station



ステーション(ごみ・資源回収場所)ごとに定期的に行っている資源回収に加えて、使用済小型電子機器等専用のコンテナを新たに設置し、回収する手法

## event



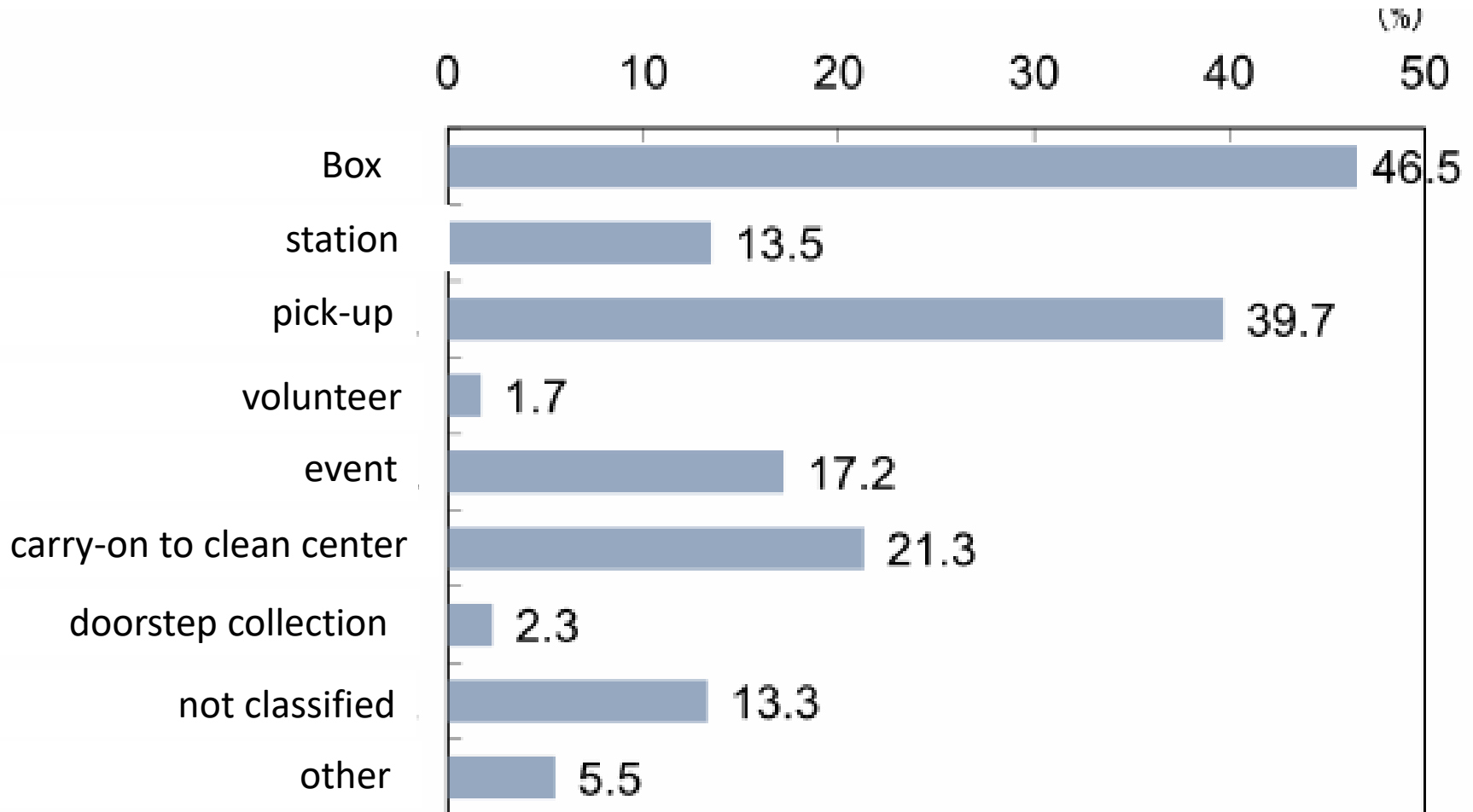
集客力の高い各種イベント会場や家電量販店にボックスを設置し、イベント開催の期間に限定してボックス回収を行う手法

## pick-up



各自治体等の従来の分別区分に従って排出されたごみや資源から、使用済小型電子機器等をリサイクルセンター等で抜き取る手法

# percentages of collections by local governments



Urban mined medals  
go beyond 2020



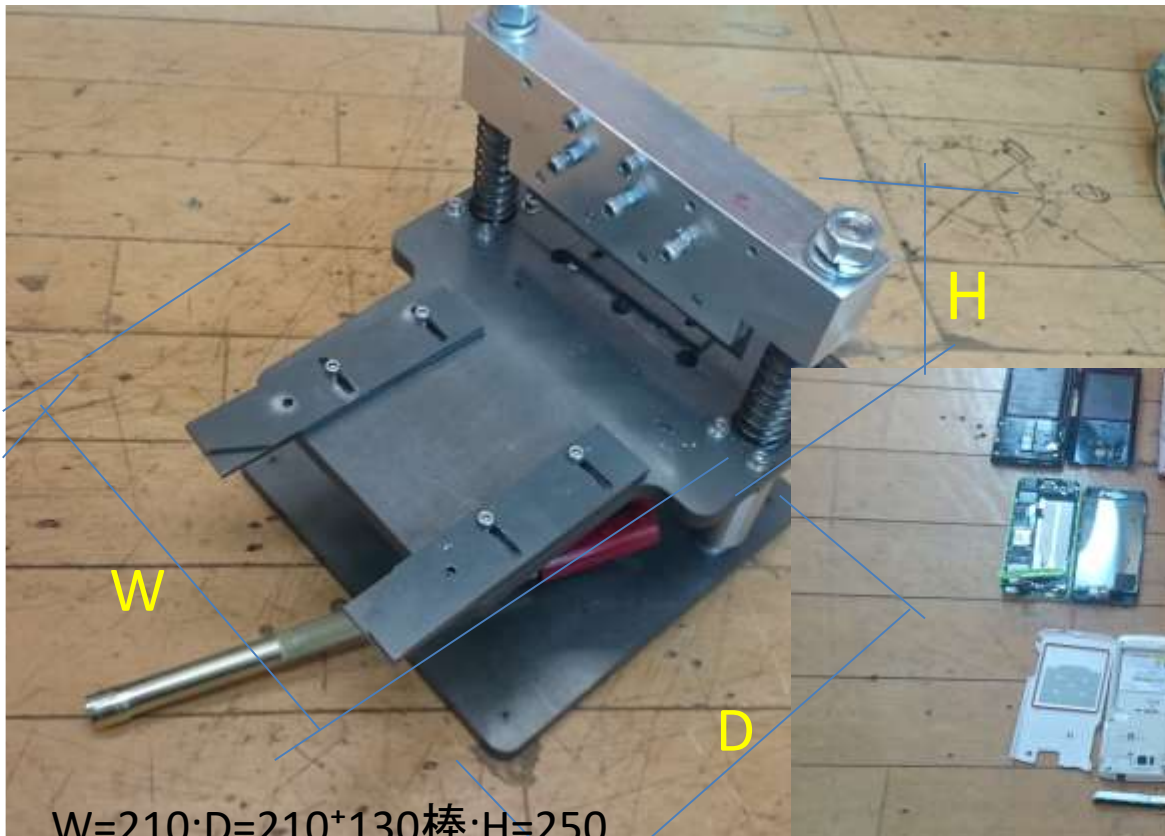
# Urban mined Olympic medals are now in mining





# 携帯電話「剪断機」リチウム(Li)電池取り出し機

リチウム(Li)電池よりの火災社会問題...早く取り出しませんか



W=210:D=210\*130棒:H=250

重量10Kg

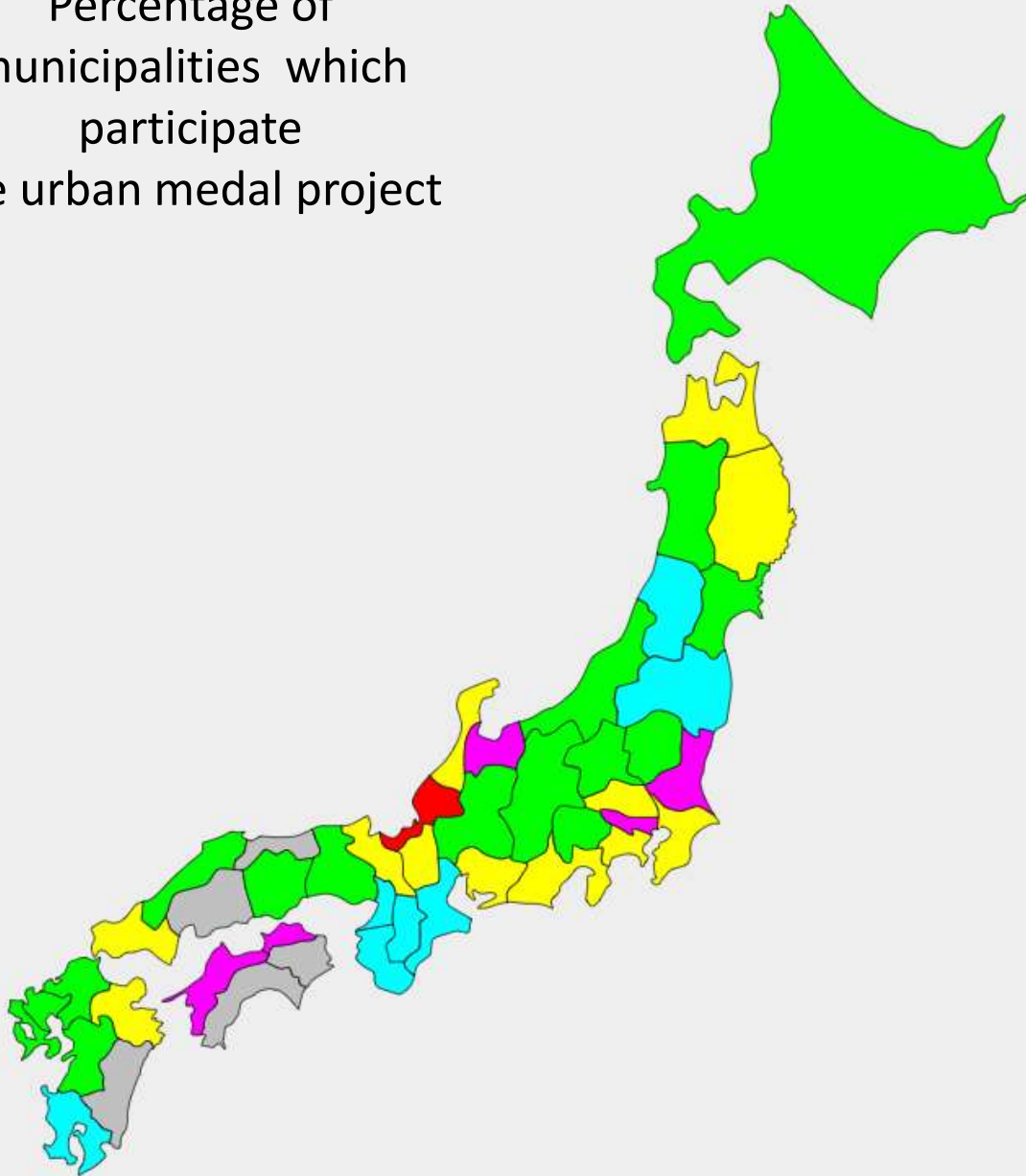
- \*\*簡単
- \*\*確実
- \*\*安価
- \*\*小型



販売代理店

カクク No.7615A

Percentage of municipalities which participate the urban medal project



100%
2/3-
1/2-
1/3-
1/5-
8%-

# Kyoto city adopt urban mined gold medal to Kyoto city marathon.





Urban mined medals  
of **local governments'**  
**events**  
will be the symbol of  
recycling of the area.



It contains my old  
electric  
households

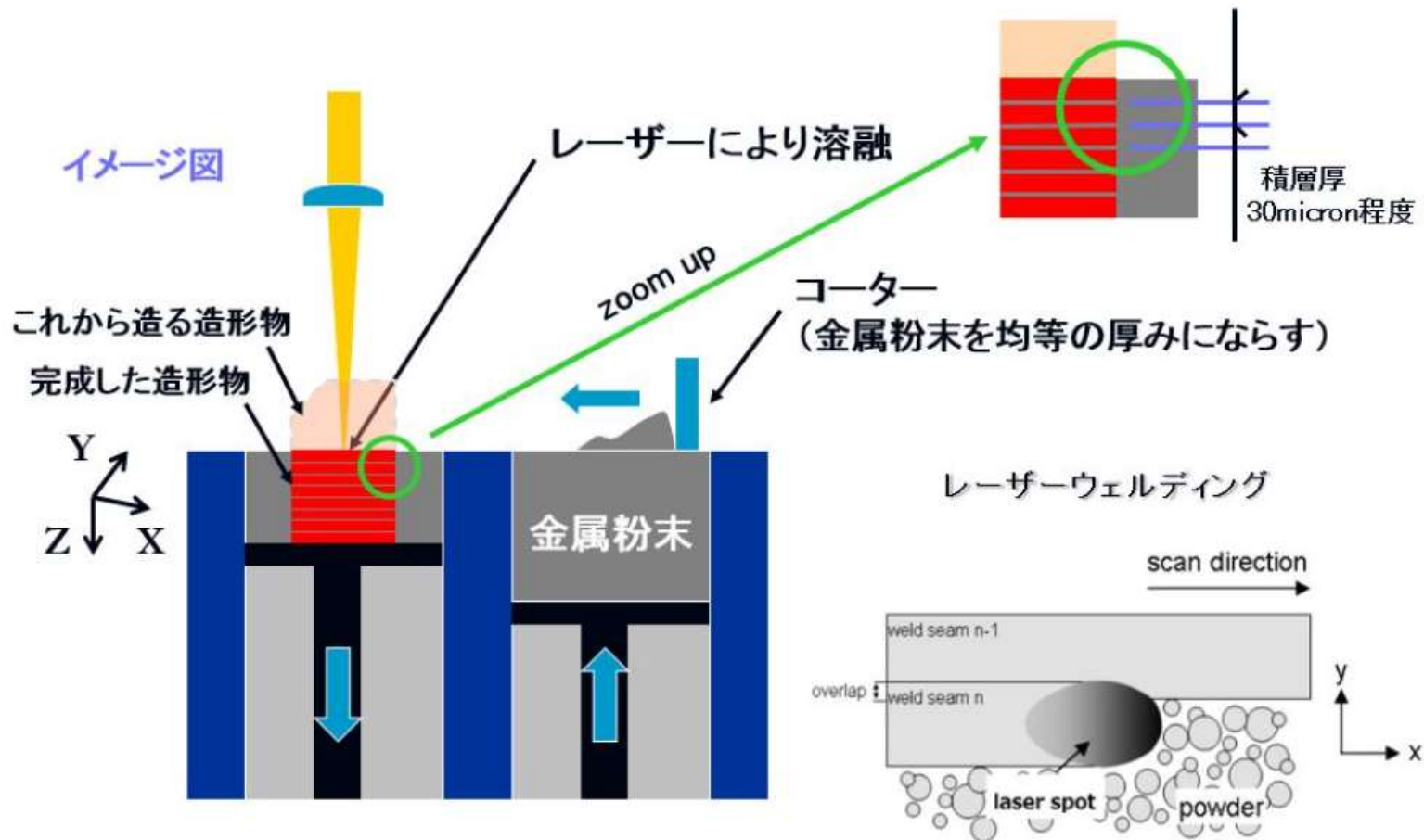


# NIMS's Urban mined Medal beyond 2020

Easy customize to local events  
Lower environmental impact

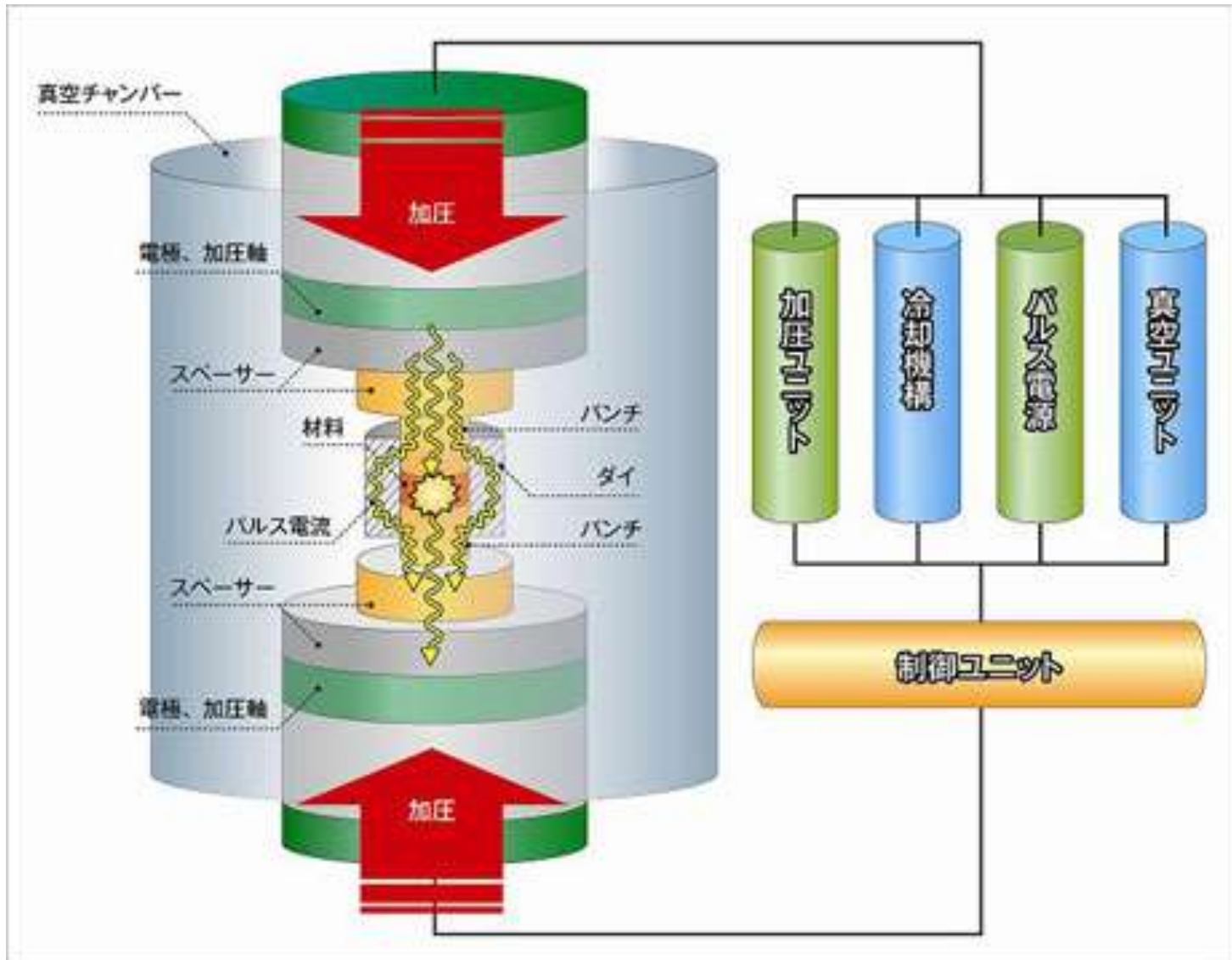


# Customizable 3D printed medal based by recycled Ag powder





# Wasteless, short-time Spark Plasma Sintering



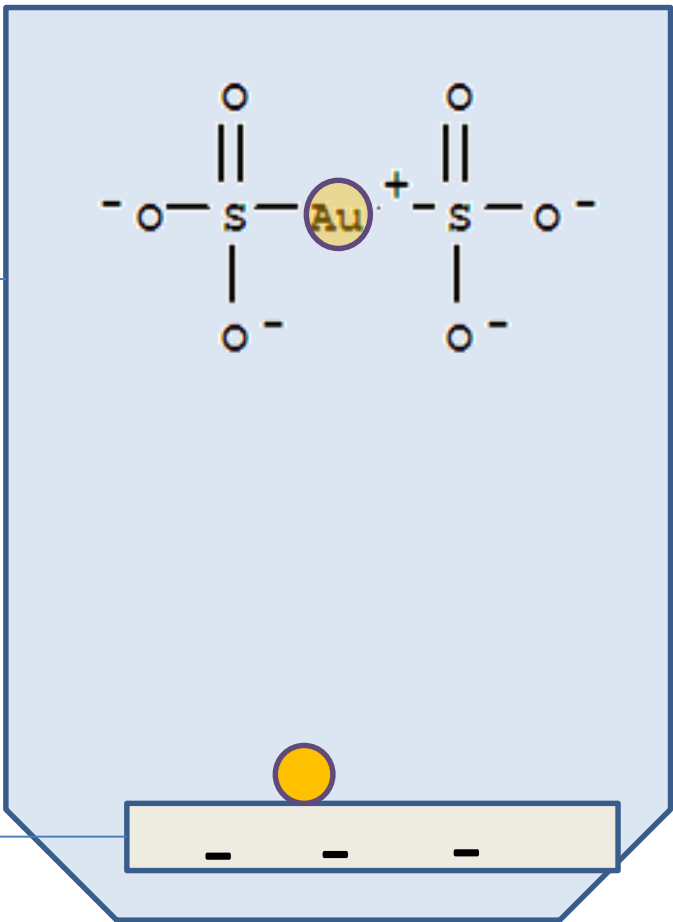
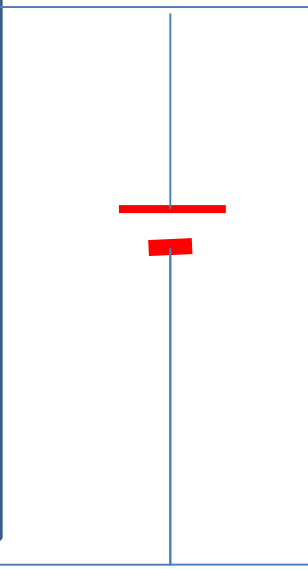
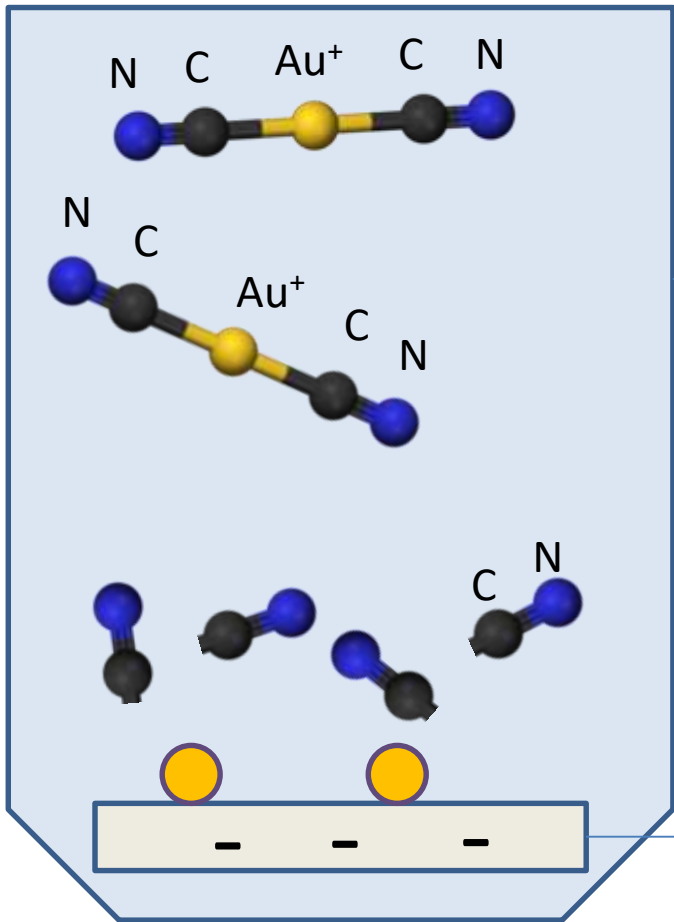


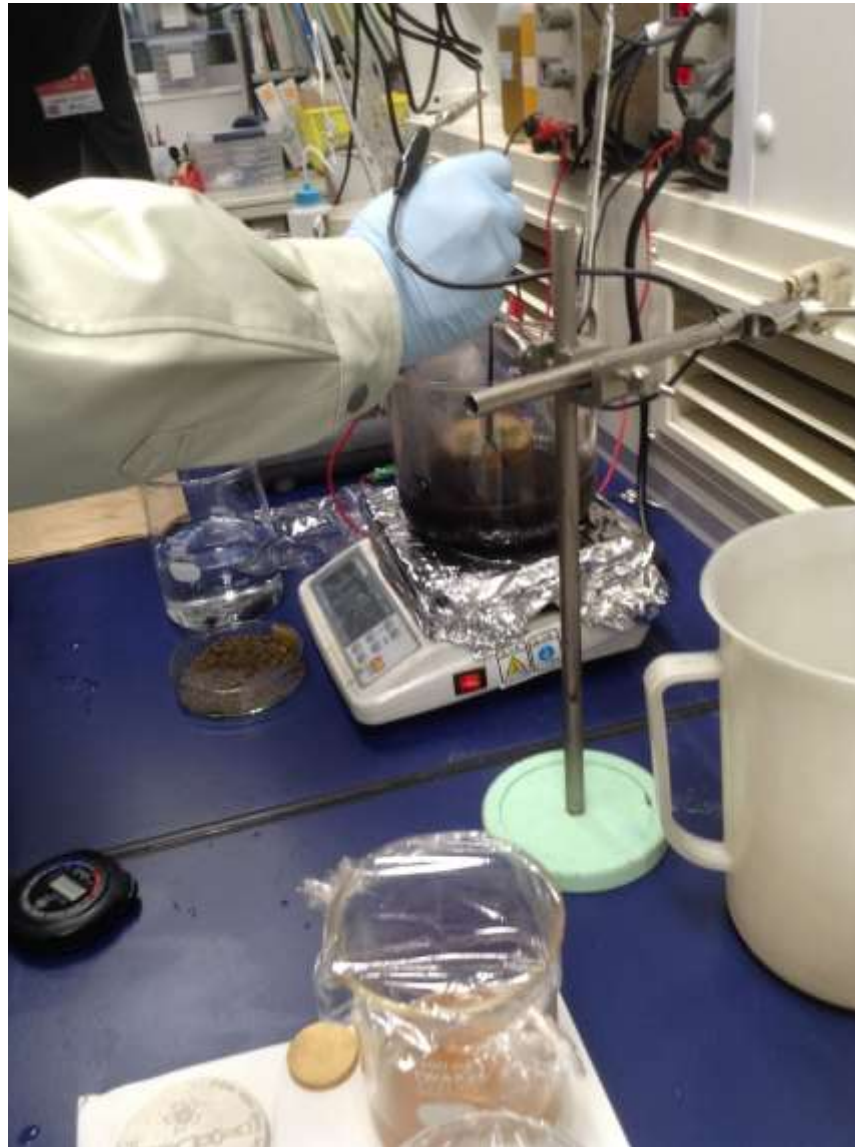
# Cyanide-free plating without toxicity

Conventional cyanide gold plating



Cyanide-free gold plating





toward 2020 and beyond it,

Let us  
establish the urban mined  
medal as symbol of  
recycling.



Thank you !!