

Activities on biomass research in Hiroshima University and Chugoku District

Yutaka Nakashimada

*Graduate School of Advanced Sciences of Matter
Hiroshima University*

*UNEP/GEC Symposium
2010.3.4*

Contents

- 1. Introduction**
- 2. Biomass in Chugoku District**
- 3. Research activities in Chugoku distinct**
- 4. Research Team for Biomass Utilization in Chugoku District**
- 5. A project for Biomass utilization in Chugoku Distinct**

1. Introduction

What is biomass?

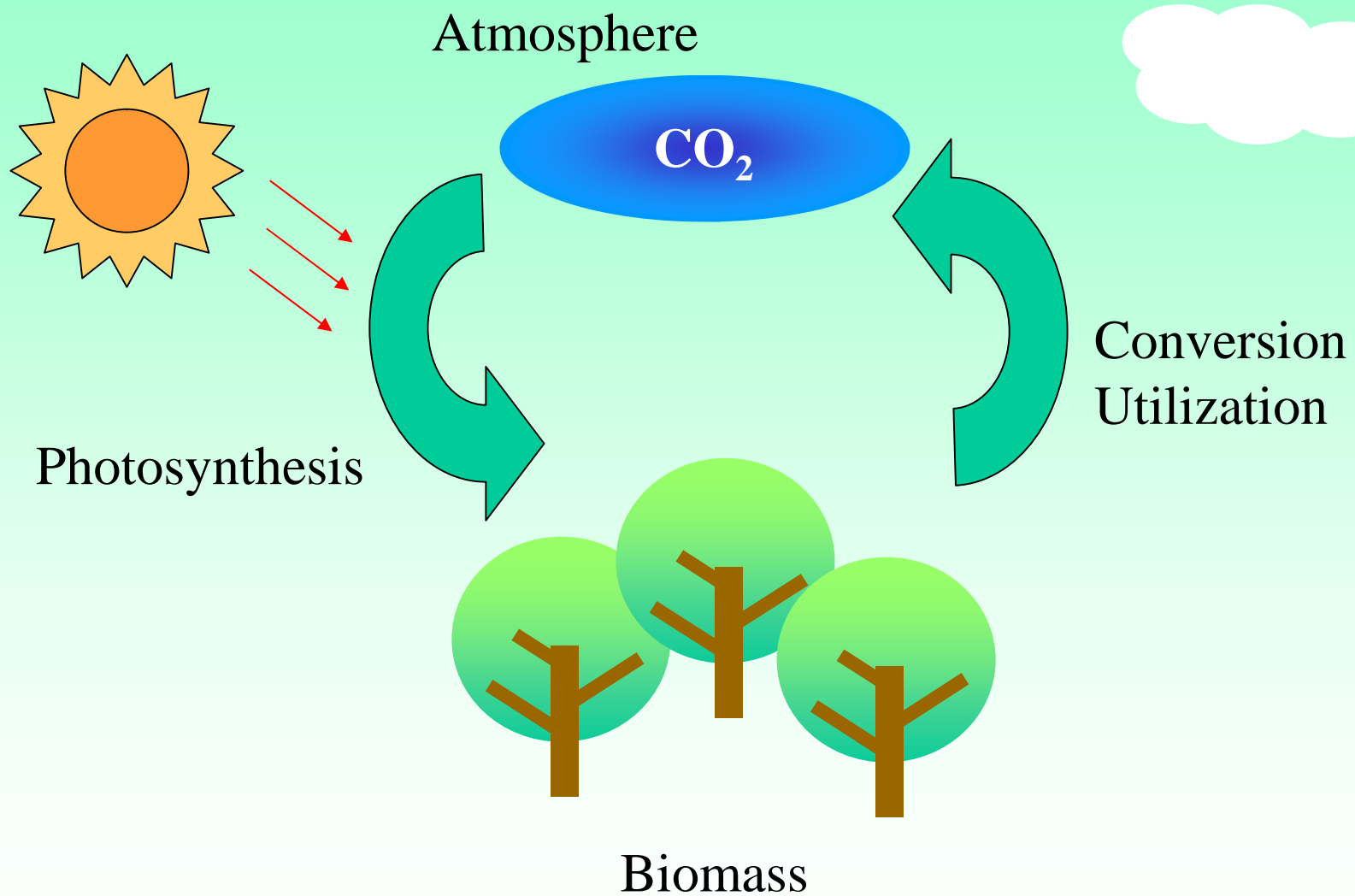
Biomass — Organic compounds produced from the activities of living creatures which can be used as energy or material feedstock.

Wood, grass, manure, sewage sludge, aqueous plant ...

Use for material Particle board, activated carbon, etc.

Use for energy Biodiesel, Biomass power, etc.

Characteristics of biomass



Renewable, Carbon neutral

2. Biomass Utilization in Chugoku District

Where is Chugoku District ?



Biomass Resource in Chugoku District

Biomass species	Amount [TJ]	
Construction/demolition wood	5,600	} Woody 37,800 TJ 200,000 persons
Timber mill waste	5,600	
Thinned wood leftover	6,700	
Unused wood	19,900	
Papermaking waste	47,000	
Rice straw	5,800	} Wet 15,180 TJ 80,000 persons
Rice hull	480	
Livestock manure	9,500	
Food waste	1,800	
Sewage sludge	2,500	
Septic tank waste	380	
Kitchen garbage	1,000	

3. Research activities in Chugoku distinct

Activities in Chugoku District

Hiroshima Univ. Biomass Project Research Center

AIST Chugoku Biomass Technology Center

METI Chugoku, Prefs. Cities. Various committees

Industrial and Agricultural centers R&D

MAFF Chugoku & Shikoku Biomass Nippon Strategy

Daisen, Maniwa, Niimi, Shobara, Kita-Hirohsima, ...Ube
Biomass Towns

Chugoku Electric Biomass resource investigation

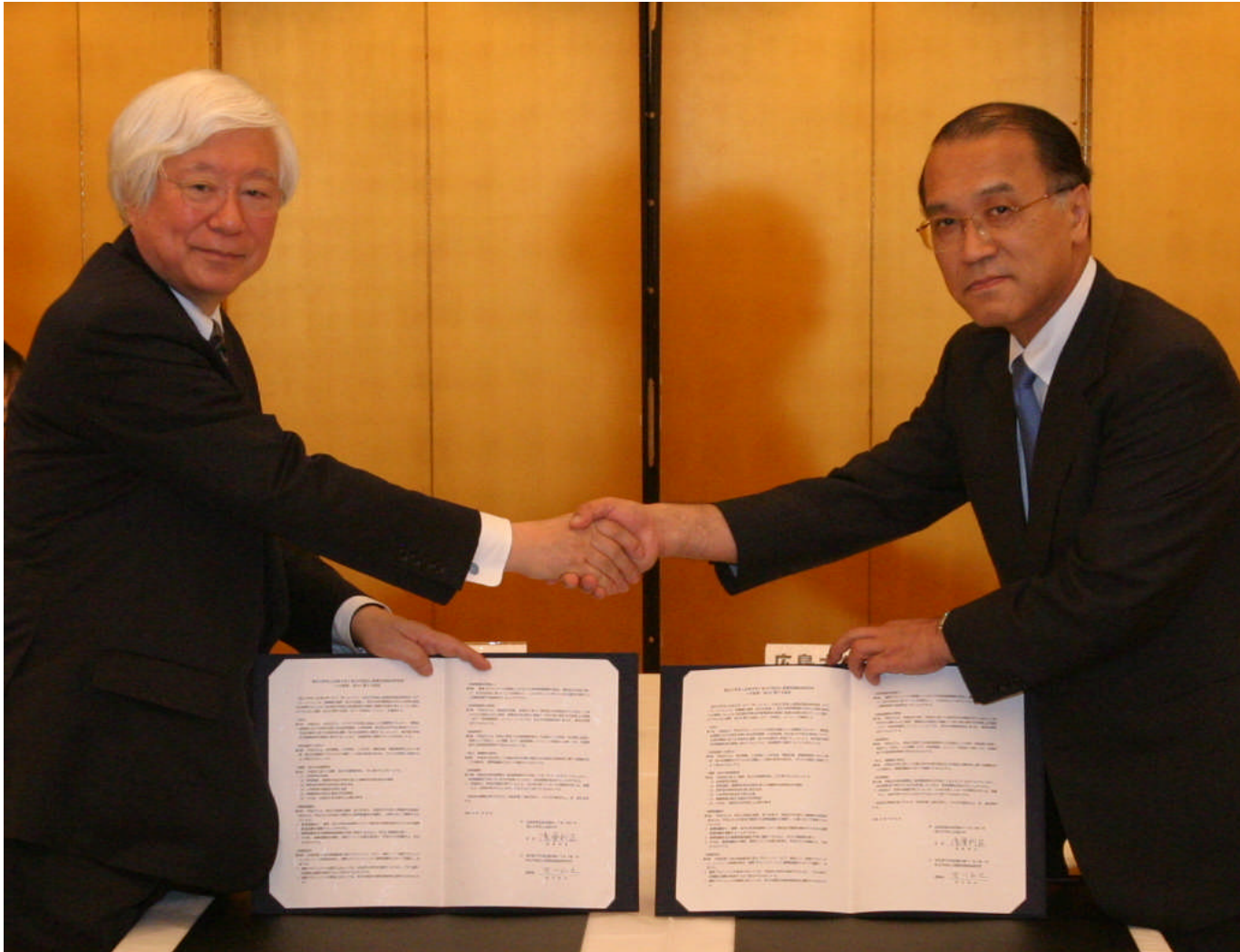
Chugairo Co. Demonstration of rotary kiln gasifier

Think tanks Strategy for biomass introduction

NPOs Activities in Shobara, Chugoku Prefecture, etc.

Individual activities

Collaboration MOU between AIST and Hiroshima Univ. on Biomass (2007.7.25)



Collaboration MOU on Biomass (2007.7.25)

AIST Chugoku



Transfer to Higashi-Hiroshima -2010.3

Hydrothermal/separation team
Ethanol team
BTL total system team
BTL catalyst team
Biomass system technology team

Biomass Technology Research Center

Hiroshima Univ.



Grad. Sch. Engineering
Advanced Mat. Sci.
International Development
Agriculture

Biomass Project Research Center

Asia Biomass Center

Additional post
Collaboration



Technology

System

Environment



Additional post
Collaboration
Staffs

Biomass strategy in Chugoku District

AIST Chugoku



Hiroshima Univ.



Moving to Higashi-Hiroshima 2010.3



Biomass Town (Pref.-MAFF)

Networking of present activities

Creation of new manufacturing industry

Utilization of local resources and activation of the district

Chugoku District as No. 1 of Biomass

4. Chugoku District Biomass Utilization Research Team

Purpose

This research team is a network of people working on biomass in Chugoku District, aiming at proceeding technology development on biomass utilization through matching of needs and seeds, making Chugoku District a center of biomass utilization in Japan, promoting biomass utilization, and activating the manufacturing industry in Chugoku District.

Biomass utilization

For the development of the local communities

1. Utilization of local biomass
2. Development of new industry

➔ Increase in local GDP and promotion of employment

Chugoku District Biomass Utilization Research Team

Biomass Project Research Center, Hiroshima Univ.
Biomass Technology Research Center, AIST

Re-activation of the Chugoku District

A project for Biomass utilization

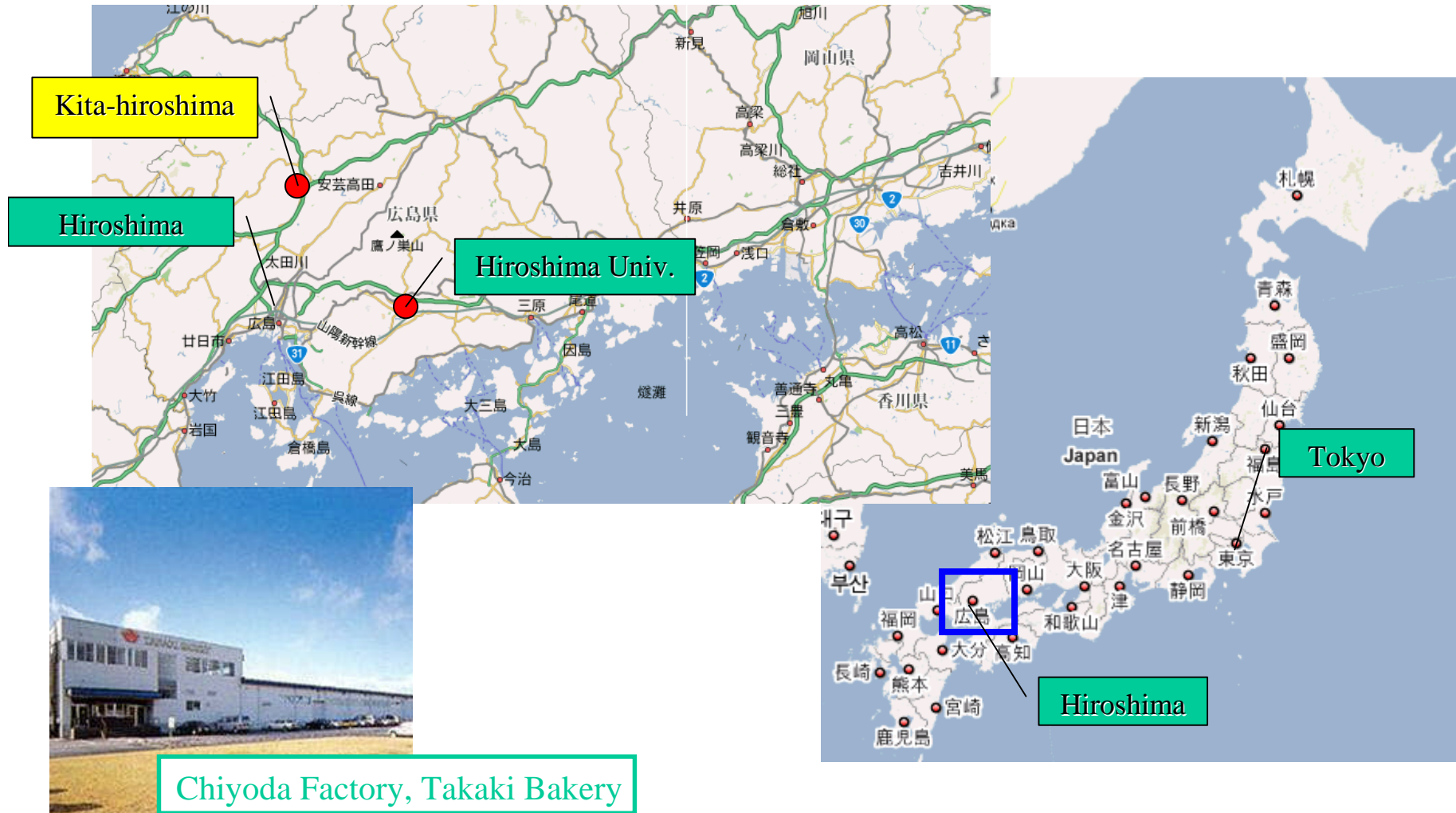
Field Test of Hydrogen Fermentation at Kitahiroshima,
Hiroshima Pref .

Converting Food Waste to Bio-Hydrogen / Bio- Gas Technology Development Project

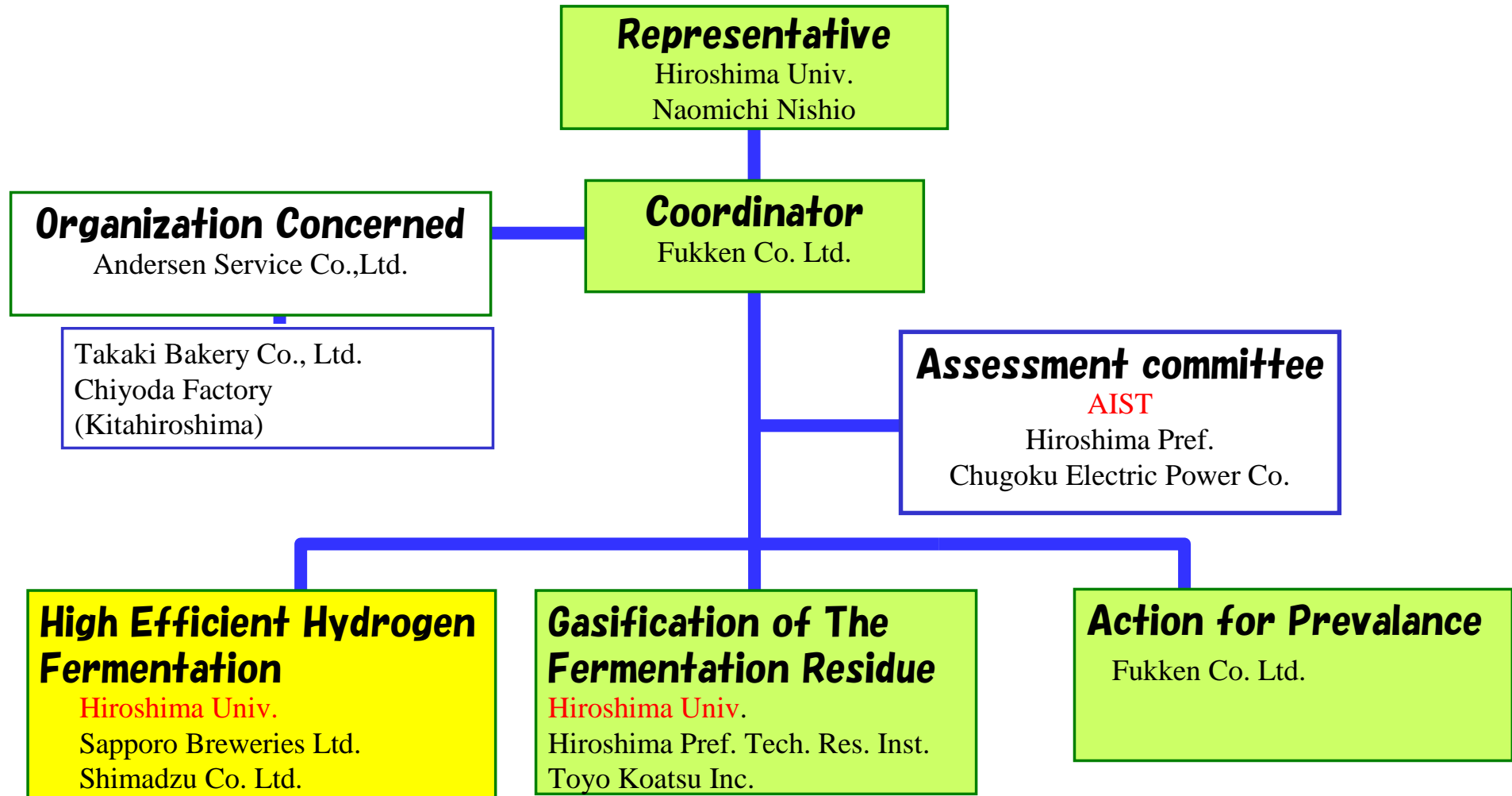
Greenhouse gas mitigation technology development
program

(Supported by Ministry of Environment, Government of Japan)

Location of The Field Test Plant



A project for Biomass utilization

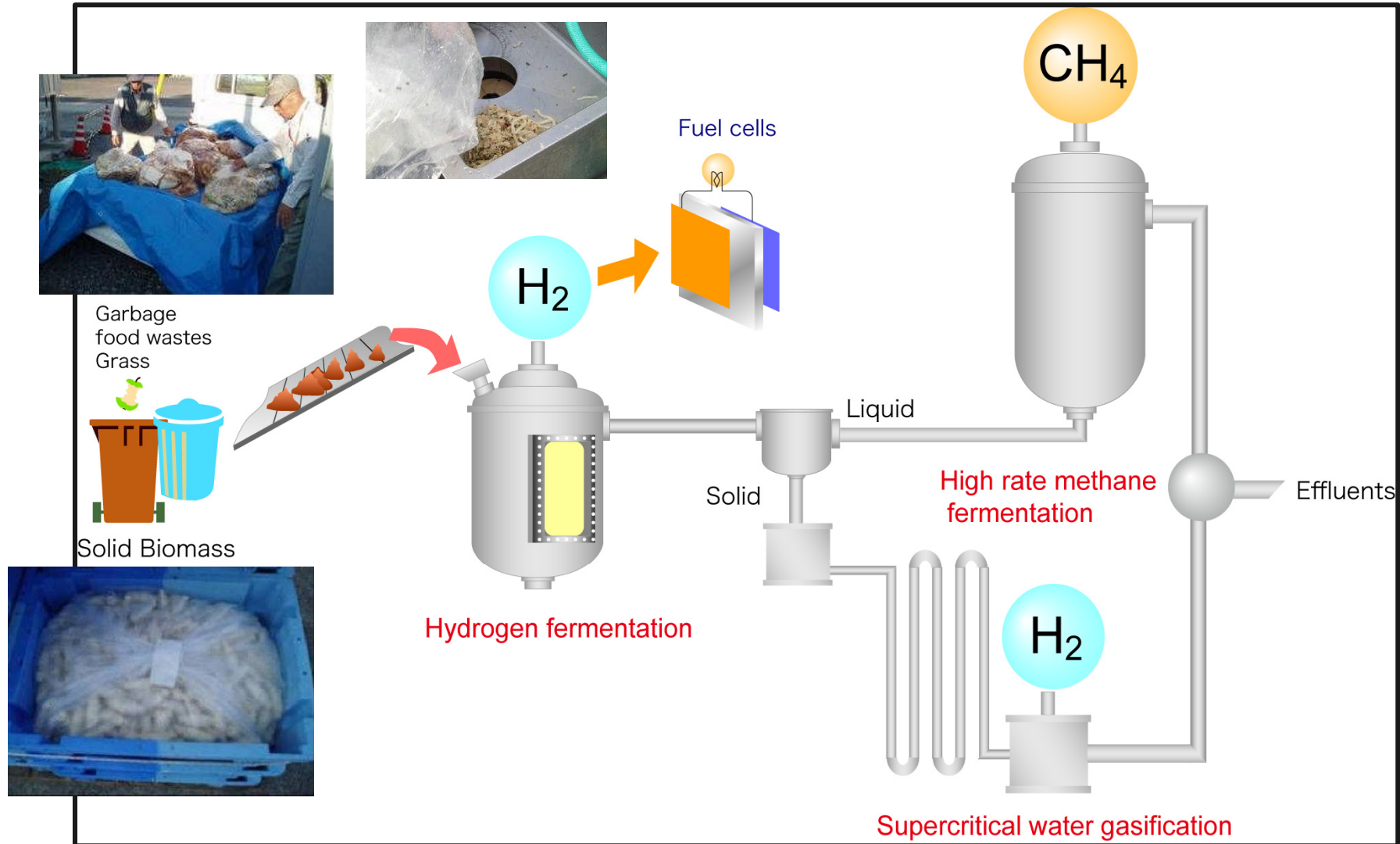


The Objective of This Project

- Establishment of the system for “producing the hydrogen / methane from food waste by fermentation and supercritical water gasification of the fermentation residue”, that system is the cascade process to effectively retrieve the energy from food waste with over 60% ratio of energy retrieval.
- Construction of the framework to prevail this system to business institutions and communities for proposal of regional network model .

Total Scheme of The System

(to maximize biogas production without solid wastes)



Field Test of Hydrogen-Methane 2-Stage Fermentation system



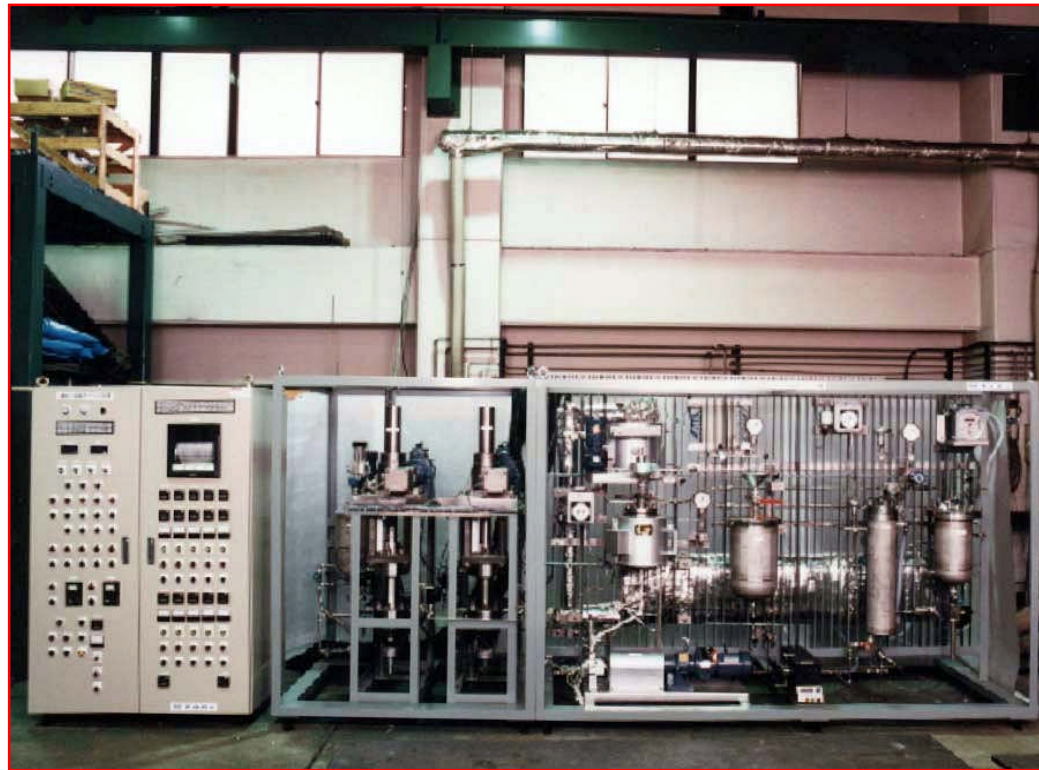
**5m³-scale
Hydrogen Fermenter**



**3m³-scale
Methane Fermenter**

Hiroshima Univ. (Prof. Nishio), Sapporo Breweries Ltd., Shimadzu Co. Ltd.

Super Critical Water Gasification



**Hydrogen production from the residue of
hydrogen fermentation**

Hiroshima Univ. (Prof. Matsumura), Hiroshima Pref. Tech. Res. Inst., Toyo Koatsu Inc

Hydrogen Production from Bakery Waste



Waste bread

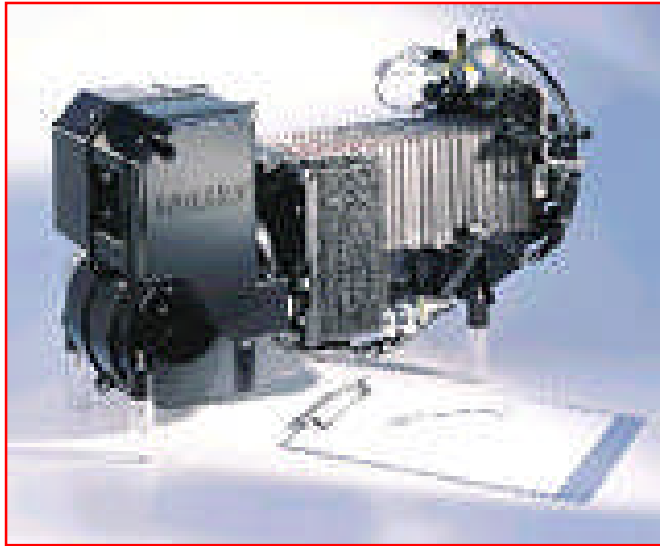


Solubilized waste bread

Hydrogen production 2–3 kmol-H₂/kmol-consumed sugar

Now in progress

Application of hydrogen



Not only
Fuel cell

But also
direct fuels for car



Mazda RX-8 with
H₂-driven rotary engine

Bioresource-recycling Strategy

