Steel Success Strategies Turkey
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Iron Metallics Market Developments

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STRUCTURE OF THE PRESENTATION

- International Iron Metallics Association
- The role of Ore Based Metallics (OBM) in steelmaking
- Global Iron Metallics Markets:
    - Scrap
    - Merchant Pig Iron
    - DRI/HBI
- Summary/Conclusions

International Iron Metallics Association

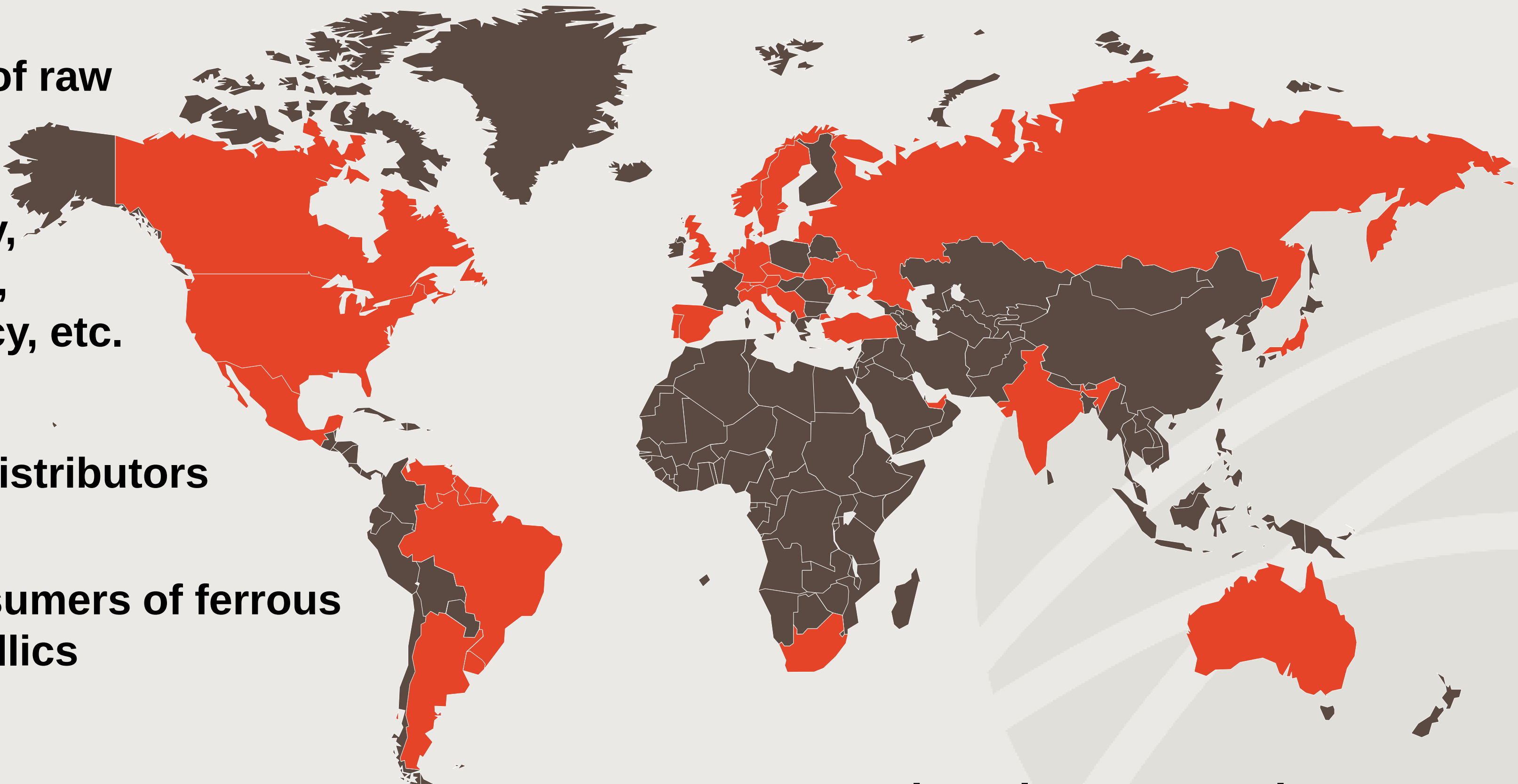
IIMA MEMBERS

Producers of Merchant Pig Iron (MPI), Hot Briquetted Iron (HBI), Direct Reduced Iron (DRI) and Iron Nuggets

Suppliers of raw materials, logistics, technology, equipment, consultancy, etc.

Traders/Distributors

Consumers of ferrous metallics



103 members in 36 countries

PURPOSES

PROMOTE

The use of ore-based metallics in steel production and iron casting

REPRESENT

The collective interest of members

COLLECT & PRESENT

Trade statistics and Industry data

PROVIDE

A forum for technical co-operation and exchange of views

REALIZE

Projects and technical studies of common interest

CURRENT INITIATIVES

- World Steel Association – Affiliated Member
- International Council on Mining & Metals – Associate Member
- International Maritime Organisation – Consultative status
- Dry Bulk Terminals Group – Cooperation Agreement
- Association for Iron & Steel Technology – Personal memberships
- South East Asia Iron & Steel Institute – Affiliate Member
- Steel Manufacturers Association, Arab Iron & Steel Union, Sponge Iron Manufacturers Association, a number of National and Regional Foundry Associations – working relationships

ROLE OF ORE BASED METALLICS IN STEELMAKING

ORE BASED METALLICS - OBM

- DRI, HBI, pig iron and iron nuggets are manufactured from iron ore, they are ore-based metallics (OBMs). Other names: Virgin metallics, primary iron, etc.
- OBMs are best used as **SCRAP SUPPLEMENT** to dilute impurities in ferrous scrap in EAF steelmaking
- HBI can be used in BOF steelmaking and in BF ironmaking

DRI

HBI

Iron Nuggets

Pig Iron

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BENEFITS OF OBM

- **Low residuals content reduces impurities in steel**
- **Consistent predictable chemistry, mass and heat balances**
- **Controlled C content, consistent C recovery**
- **Better slag foaming**
- **Continuous feeding and high density feedstock**
- **More consistent EAF operations**
- **Lower N content in liquid steel**
- **Stable year-round production and supply**

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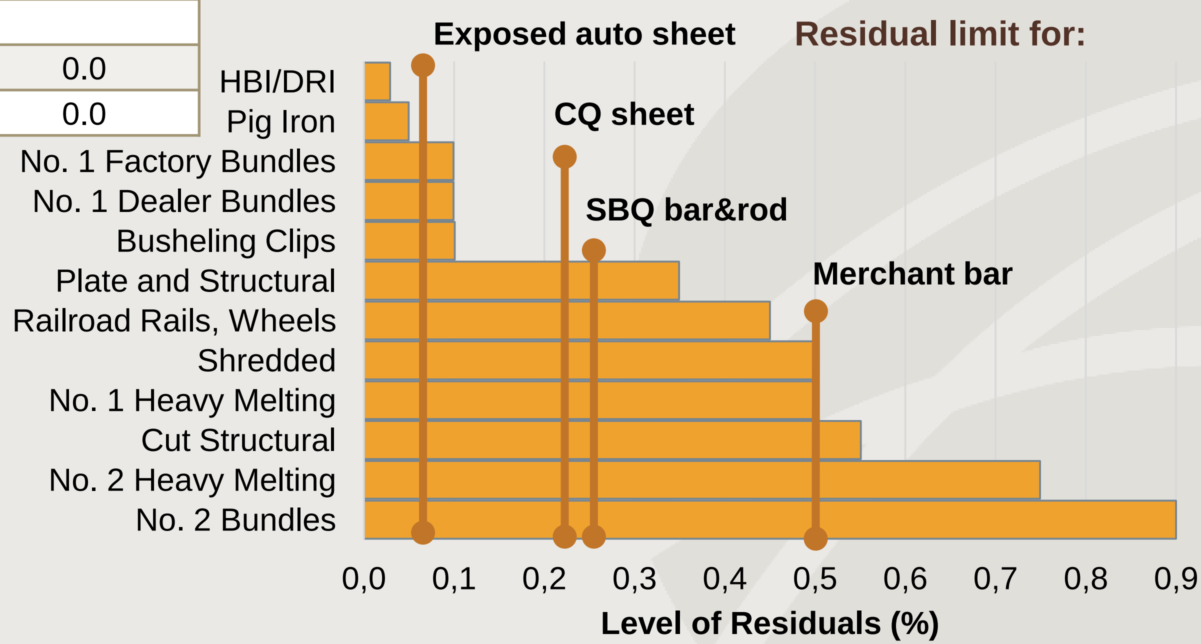
STEEL SPECIFICATIONS AND METELLICS FEED QUALITY

Metallics Type	Cu Content	Value Used
#1 Dealer Bundles	0.1	0.1
Bushelling	0.08 - 0.1	0.8
#1 HMS	0.25 – 0.35	0.3
#2 HMS	0.4 – 0.6	0.5
#1 Shredded	0.15 – 0.2	0.17
#2 Shredded	0.25	0.25
P&S	0.12 – 0.2	0.15
OBM Types		
HBI/DRI	0.002 (depends on ore)	0.0
Pig Iron	0.002 (depends on ore)	0.0

The inherent cost of a point (0.01 weight %) of copper in the scrap has been determined to be approx.$2.00



Charging Mix is Determined by Product Quality Requirements

OBM VIU PROJECT

- IIMA Metallics VIU study - US steel industry consultant Jeremy Jones.
- The first stage: estimation of harmful impurities influence.
- The calculation was based on typical content of copper and historical price evaluations for various scrap grades, HBI and pig iron on the US market for the last 10 years.
- Value-in-use was determined by calculating the cost of a ton of premium scrap compared to the cost of a blended ton of OBM and lower grade scrap to achieve the same Fe input and copper level as that contained in the higher grade scrap.
- The analysis has shown that considerable savings can be accumulated through replacement of premium scrap for OBM and lower grade scrap blend: from - 43$ to 331$ per ton of metallics blend over the 10 year period. Average savings were $5.50 - $53 per ton of metallics.
- The project demonstrates the possibility of metallics costs reduction by combination of OBM and scrap use in EAF steelmaking.

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MERCHANT OBM CONSUMPTION IN 2012

Main importers	Merchant HBI/DRI consumption, mln. t	Consumption of MPI, mln. t	EAF steel production, mln. t	Average OBM consumption per 1 t of EAF steel*, kg/t
USA	2.76	4.27	53.5	108
Italy	0.51	1.11	17.9	72
Spain	0.44	0.27	10.2	62
South Korea	0.43	0.83	26.6	38
Turkey	0.38	1.38	26.6	51
Russia	0.22**	0.80	16.2***	52

* it is assumed that 70% of pig iron is consumed by steel industry and 30% by foundry industry
** domestic supply of HBI from Lebedinsky GOK
*** excluding OEMK

Source: IIAM, AME, Metalloinvest estimations

GLOBAL METALLIKS MARKETS

2013 GLOBAL SCRAP TRADE
91 MT (est.)

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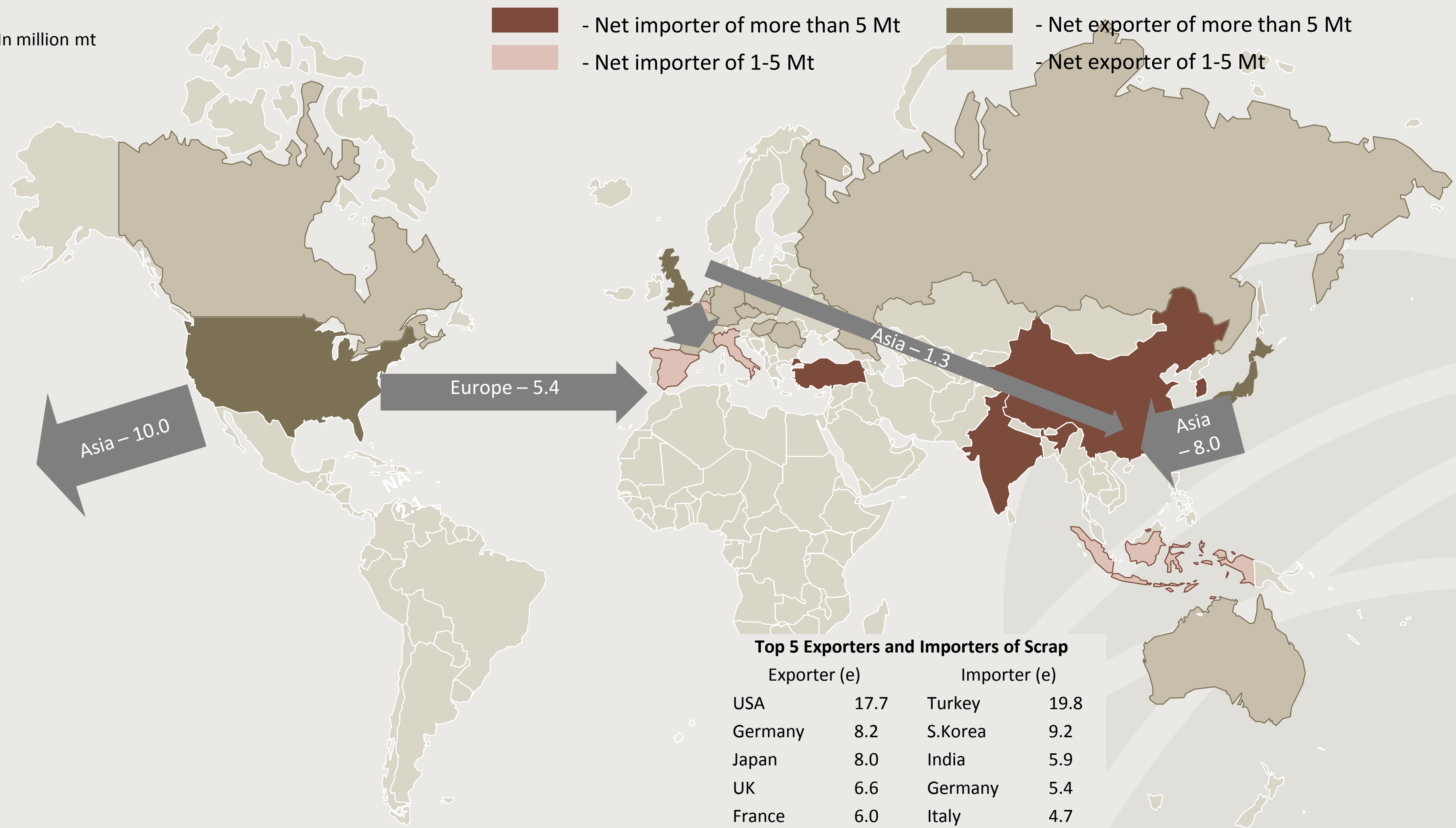
In million mt



Top 5 Exporters and Importers of Scrap

Exporter (e)		Importer (e)	
USA	17.7	Turkey	19.8
Germany	8.2	S.Korea	9.2
Japan	8.0	India	5.9
UK	6.6	Germany	5.4
France	6.0	Italy	4.7

Source: ISSB, IIMA, Metalloinvest estimations

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SCRAP MARKET

- **Prime scrap: limited availability**
- **Obsolete scrap: recent significant increase of scrap recovery rates and exports in the USA, EU – will it come back to historical levels?**
- **EU Steel Action Plan: monitoring and control of scrap export from Europe.**
- **Forecasted obsolete scrap increase in China: what would be left for exports and when? Export of scrap = export of energy.**
- **Climate change policies, ambitious carbon emissions reduction targets will stimulate domestic scrap use.**
- **Introduction of carbon emission trading system in China in 2013 in testing regime in several provinces and in the national level from 2015 will further stimulate energy saving technologies.**

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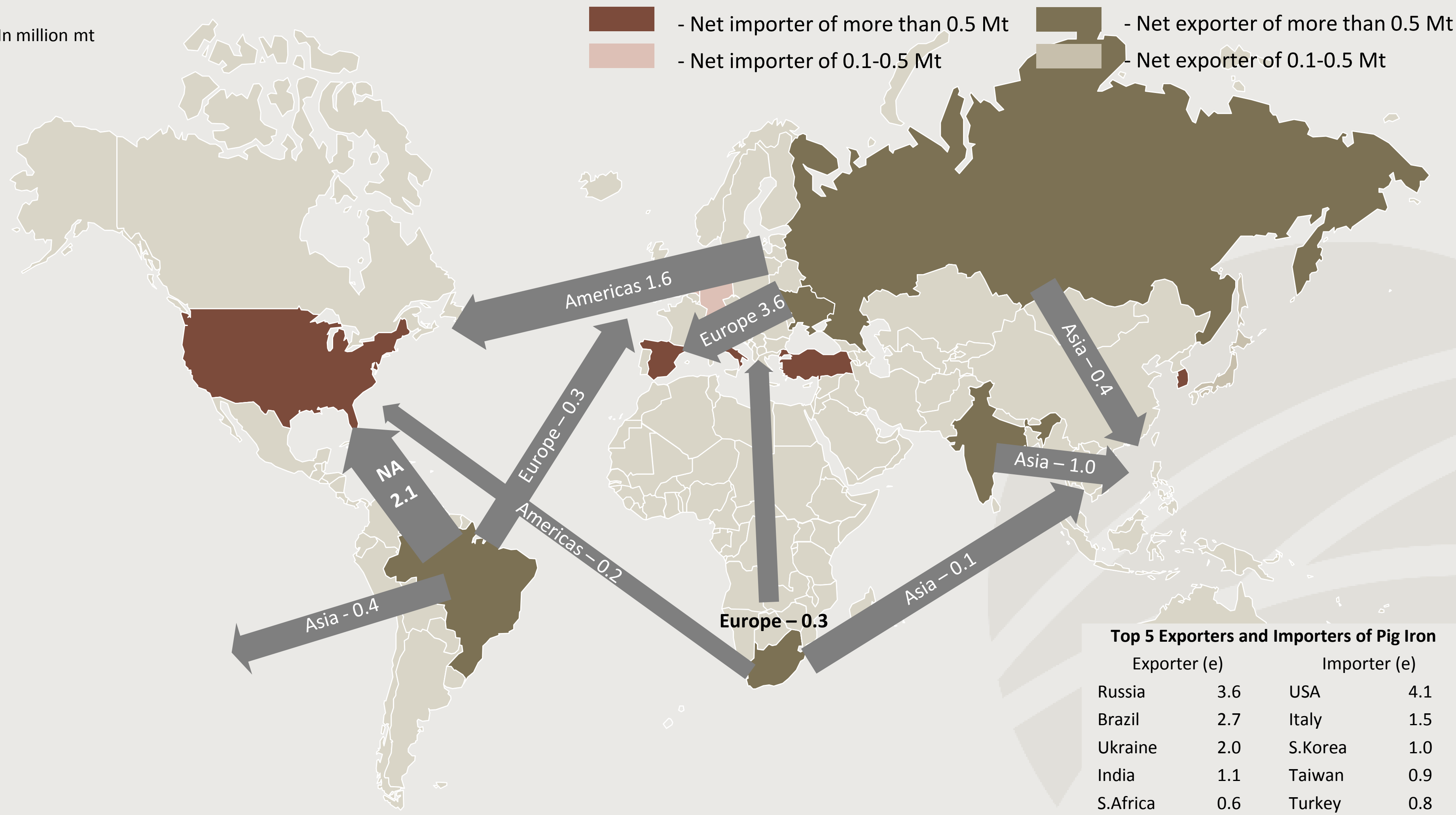
2013 GLOBAL PIG IRON TRADE 12 MT (est.)

In million mt



Top 5 Exporters and Importers of Pig Iron

Exporter (e)		Importer (e)	
Russia	3.6	USA	4.1
Brazil	2.7	Italy	1.5
Ukraine	2.0	S.Korea	1.0
India	1.1	Taiwan	0.9
S.Africa	0.6	Turkey	0.8

Source: ISSB, IIMA, Metalloinvest estimations

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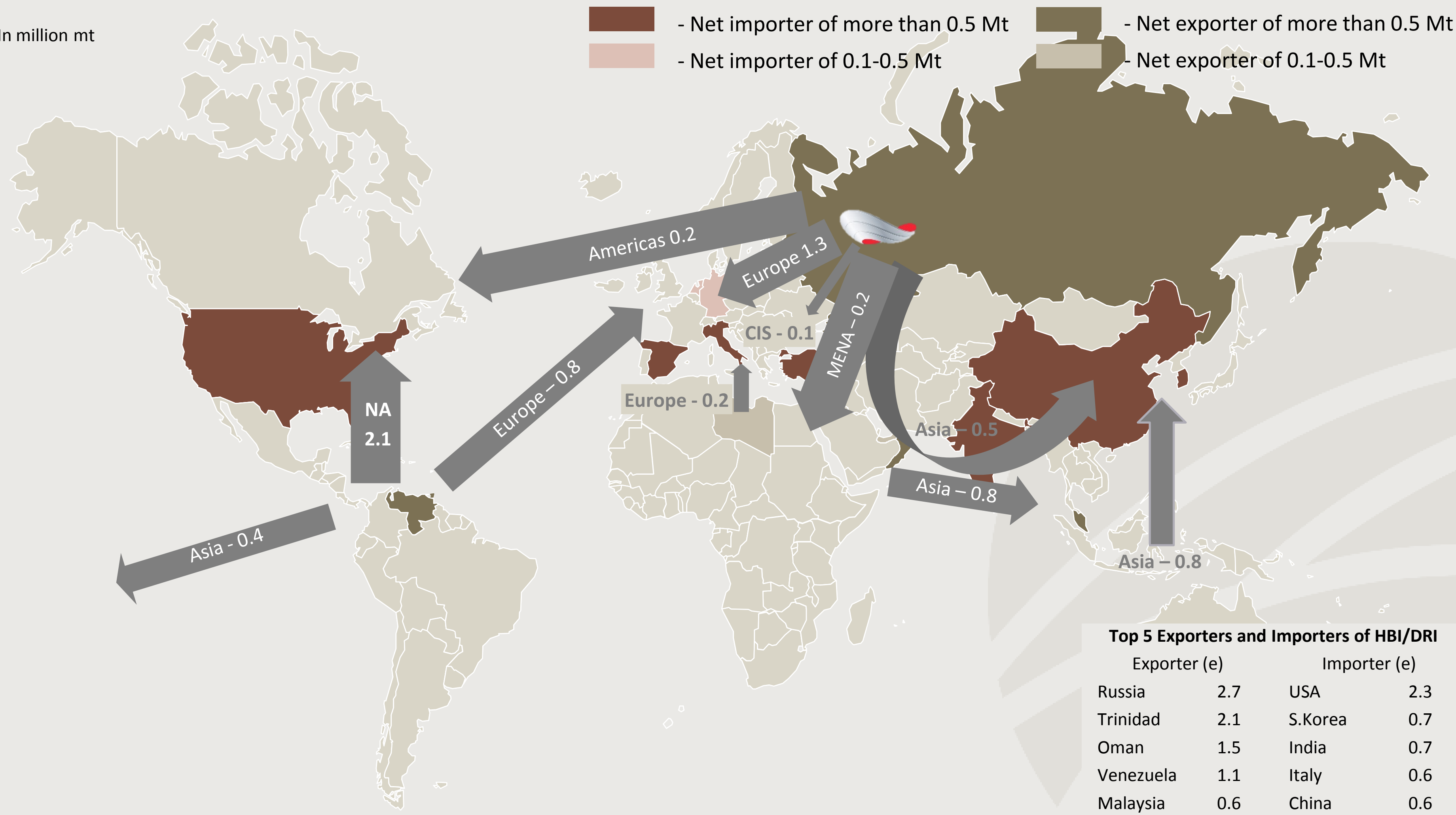
MERCHANT PIG IRON MARKET

- **Two groups of consumers: EAF steel mills (60-70%) and iron foundries (30-40%).**
- **Iron Foundries: big variety of foundry PI grades, higher quality requirements; dedicated producers in RSA, Canada, Norway, Germany, partly in Brazil and in Russia**
- **MPI production cost pressure and market conditions: significant part of charcoal BFs in Brazil remain idle, some Russian MPI BFs are out of operation.**
- **Russian Tulachermet, the biggest MPI plant, announced an intention to move into 1.5 mtpy steel production and to reduce MPI sales.**
- **Ural Steel of Russian Metalloinvest Group is planning to increase MPI sales up to 2 mtpy.**

2013 GLOBAL HBI/DRI TRADE
9 MT (est.)

In million mt



Top 5 Exporters and Importers of HBI/DRI

Exporter (e)		Importer (e)	
Russia	2.7	USA	2.3
Trinidad	2.1	S.Korea	0.7
Oman	1.5	India	0.7
Venezuela	1.1	Italy	0.6
Malaysia	0.6	China	0.6

Source: ISSB, IIMA, Metalloinvest estimations

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DRI / HBI MARKET

- **76% of DRI is produced in gas based shaft furnaces, 23% - coal based (mainly India)**
- **Further development of shaft furnace Direct Reduction technology: availability of gaseous reductant (natural gas, shale gas, synthetic gas) and iron ore of suitable quality.**
- **New DR capacities in MENA, in India are developed as a part of integrated steel mills.**
- **Direct Reduction in the USA: Nucor Louisiana – 2.5 mtpy DRI, December 2013; Voest Alpine Stahl, Texas – 2.0 mtpy HBI, 2016; several projects under discussion.**
- **Direct Reduction, Russia: Metalloinvest LebGOK – 1.8 mtpy HBI; total HBI capacity in 2016 – 4.5 mtpy.**

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SUMMARY

- International Iron Metallics Association provides wide range of services related to various aspects of OBM production, consumption, shipments, market developments etc.
- The use of OBM in steelmaking allows to improve EAF performance and to produce higher quality steel products when scrap is used in combination with OBM.
- OBM Value-in-use study confirms the possibility of EAF metallics costs reduction by blending of OBM with lower grade scrap.
- Scrap: limited availability of premium grades; long term forecasts for obsolete scrap increase in China.
- Scrap: Ambitious carbon emission reduction targets, development of national emission trading schemes (including China) will stimulate domestic scrap use in steelmaking.

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SUMMARY

- **Merchant Pig Iron: Relatively low utilization rate of existing capacities, production costs pressure.**
- **Direct Reduction: Development of integrated steel mills based on DR technology: MENA, India – no long term HBI or CDRI sales are planned.**
- **Further development of DR projects in the USA, including HBI supply into the market – pressure on metallics imports.**
- **Russia: Construction of 1.8 mtpy HBI-3 plant at Lebedinsky Iron Ore Mine of Metalloinvest will bring total HBI capacity in 2016 up to 4.5 mtpy.**

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