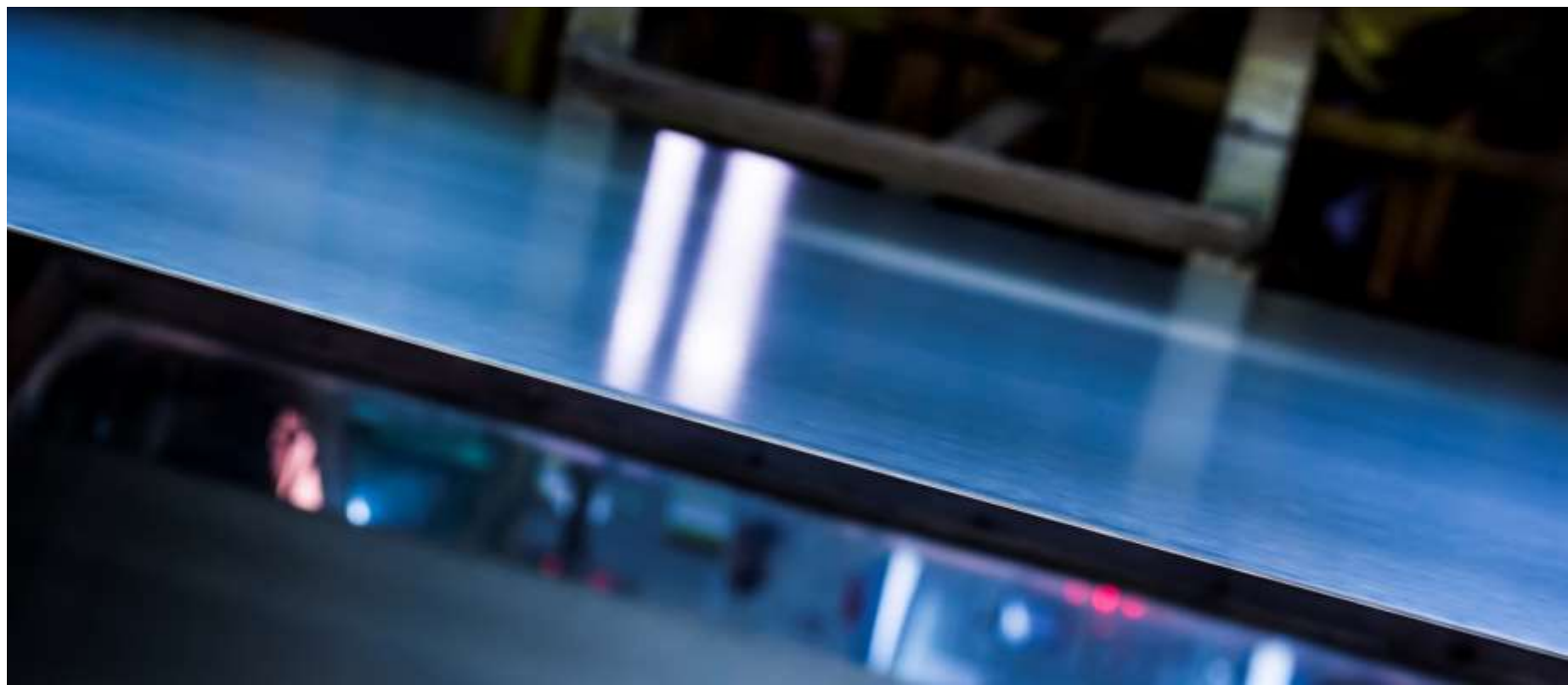


# 处于发展十字路口的中国钢铁工业

钟绍良，世界钢铁协会  
2018中国铁矿石国际会议，北京



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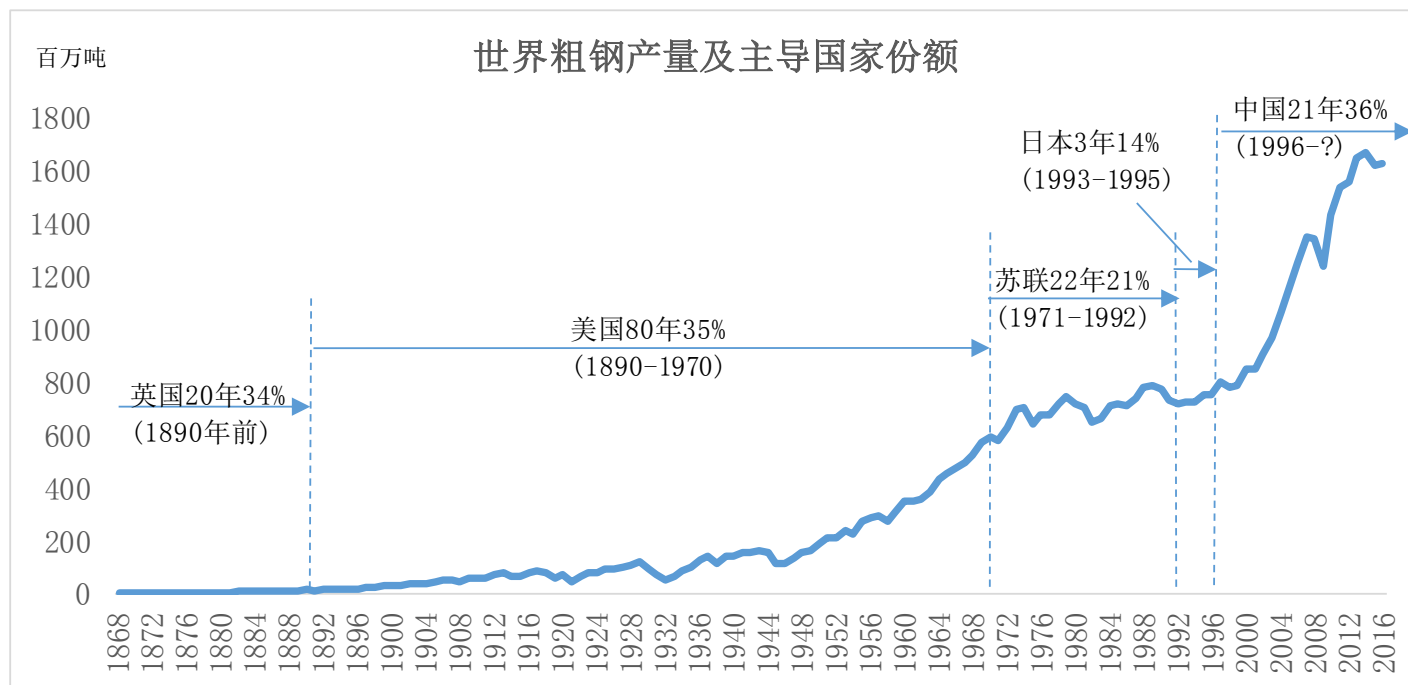
# Contents

- 中国钢铁工业发展历程回顾
- 技术路线选择：转炉 or 电炉
- 钢厂分布：沿海 vs 内地，城区 vs 远郊
- 所有制改革：国有 vs 民营

## 中国钢铁工业发展历程回顾

# 我们目前处于全球钢铁格局转变的时期

- 关于世界钢铁工业发展阶段的总体判断：
  - 我们正处在下一个巨变的前夜：企业发展出现分化，颠覆者出现，强者更强，弱者更弱，新兴企业崛起，老牌企业衰落，钢铁生产集中在一个单一地区)
  - 未来若干年代，没有其他国家可以代替中国的发展引擎地位

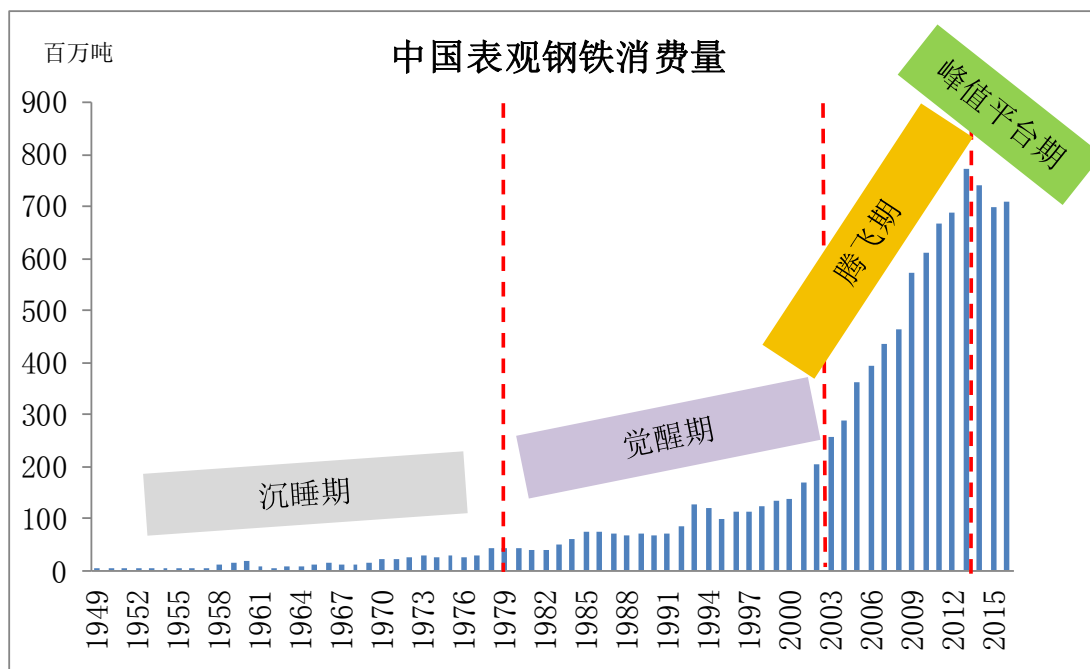


数据来源：世界钢铁协会

# 中国钢铁工业进入需求峰值平台期

- 受经济发展环境影响，中国钢铁工业的发展具有显著的阶段性特征
- 经过短暂的腾飞期目前已经进入需求峰值平台期，高速发展时代一去不复返

中国钢铁工业发展的四个阶段

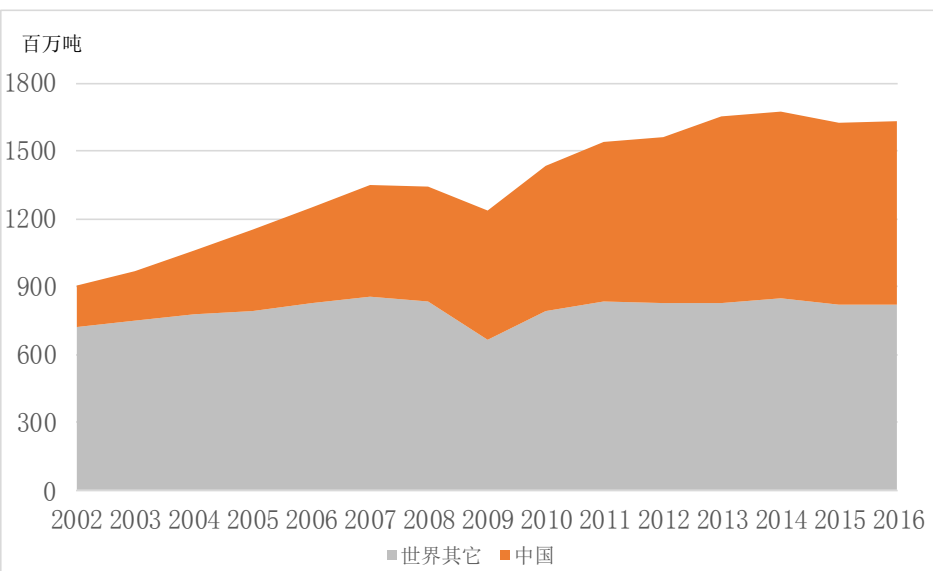


数据来源：世界钢铁协会

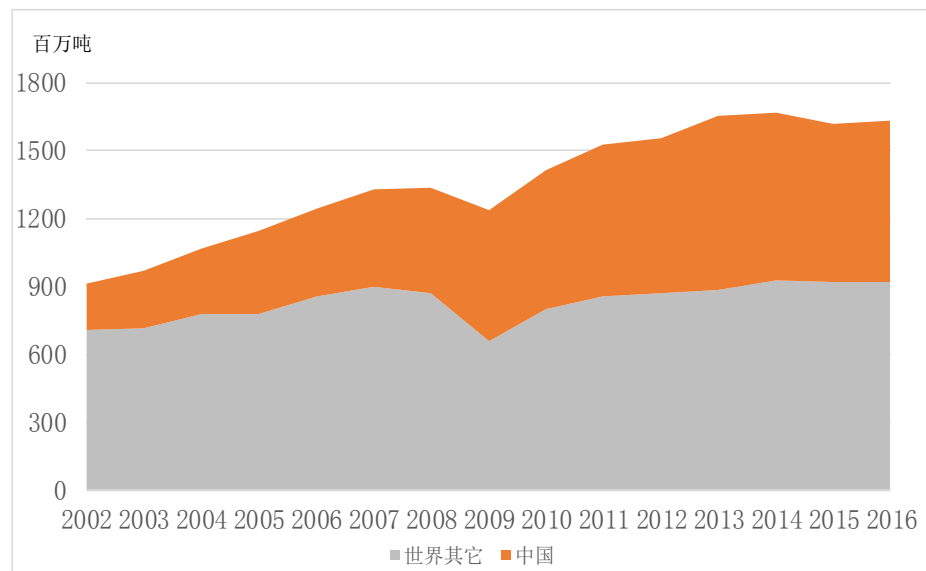
# 中国是推动世界钢铁市场发展的核心力量

- 过去15年间，世界其他国家的钢产量和消费量仅增长14%和30%，中国的产量和消费量则分别增长3.4倍和2.4倍
- 世界钢产量增量中的86%和消费量增量中的70%由中国贡献

## 中国与世界其它国家钢产量变化



## 中国与世界其它国家粗钢消费量变化

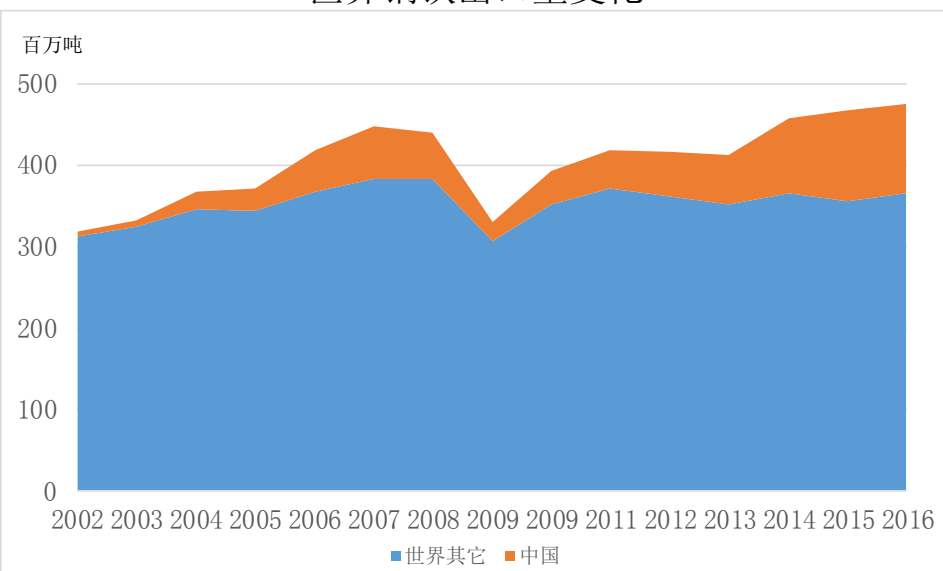


数据来源：世界钢铁协会

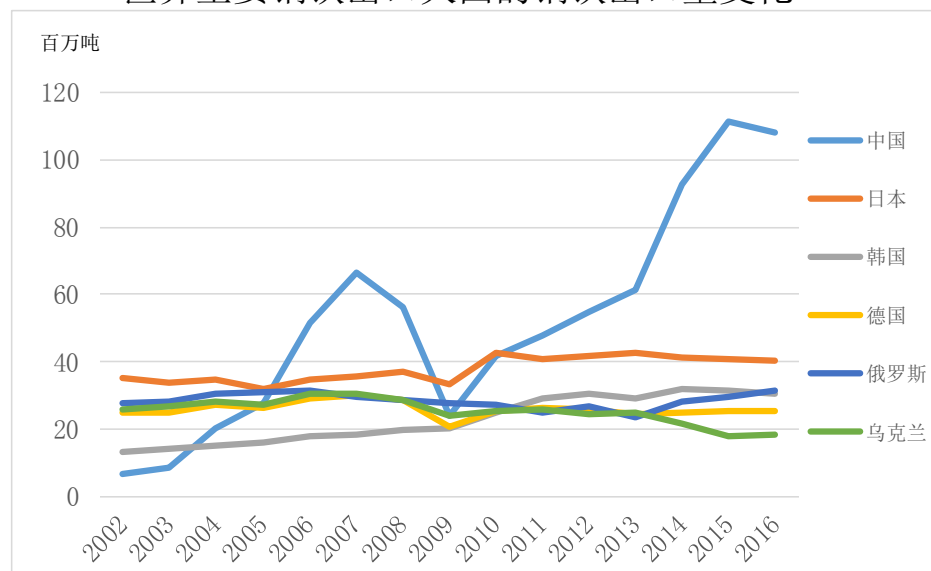
# 中国在世界钢铁贸易市场占有一席之地

- 过去15年间，世界其他国家的钢铁出口量增长17%或5380万吨，中国出口量增长了15.3倍或1.01亿吨
- 世界钢铁出口量增量中的65%由中国贡献

## 世界钢铁出口量变化



## 世界主要钢铁出口大国的钢铁出口量变化



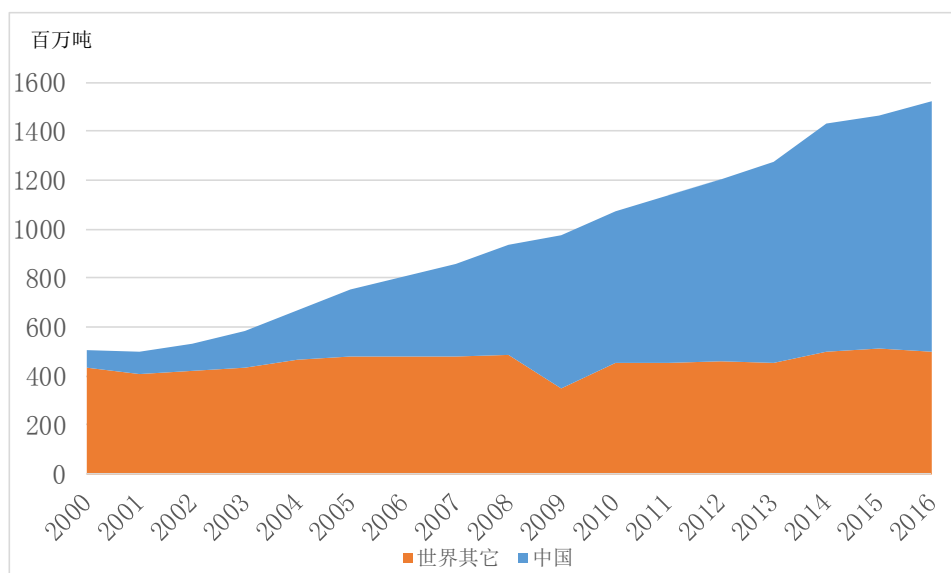
数据来源：世界钢铁协会



# 世界铁矿石贸易市场的发展完全依赖中国

- 过去15年间，世界铁矿石贸易量增长了10.2亿吨，其中9.5亿吨来自中国钢铁企业的进口，占94%，其他国家总计仅增长了6500万吨
- 中国过去新建的钢铁产能几乎95%以上为高炉流程

世界铁矿石进口量变化

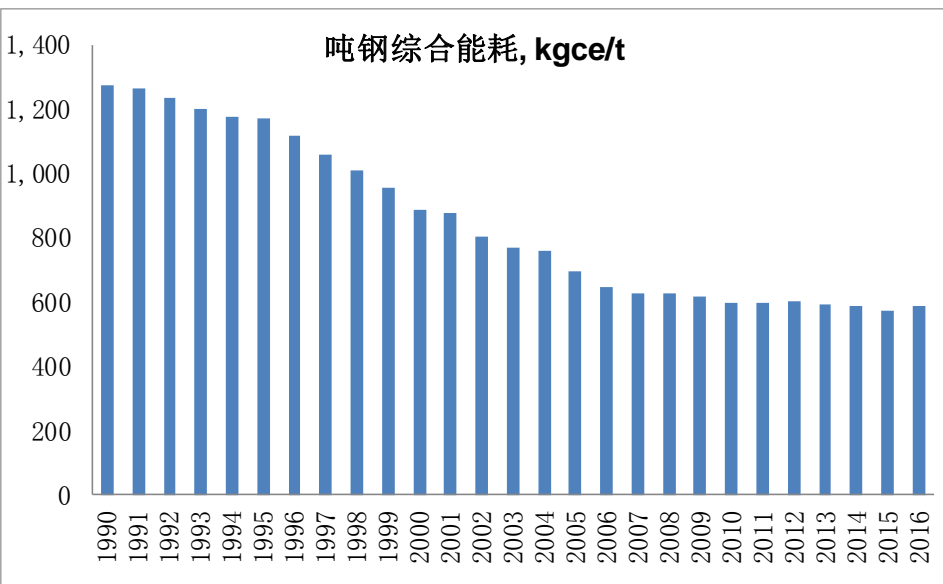


数据来源：世界钢铁协会

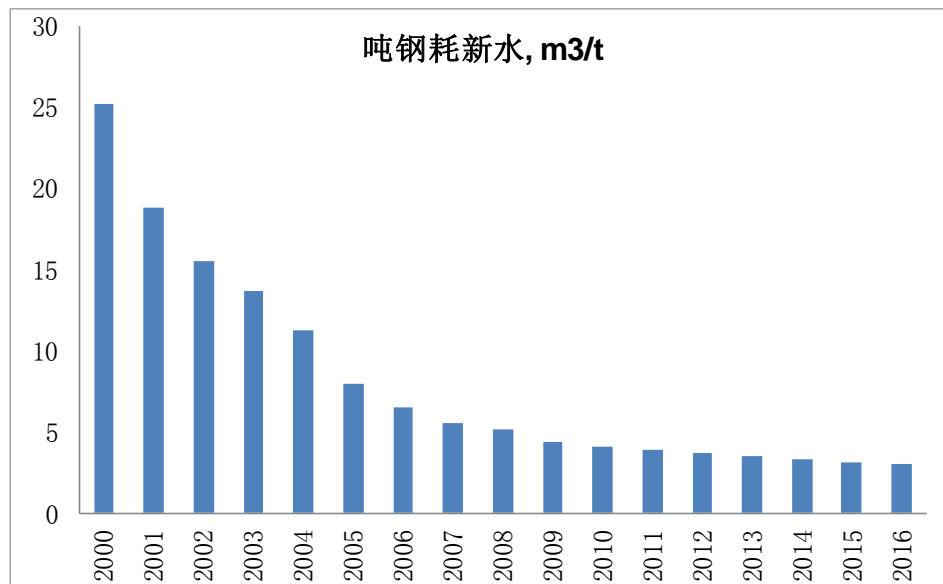
# 中国钢铁工业的节能环保成就举世瞩目

- 过去15年间，中国重点大中型钢铁企业的吨钢综合能耗下降了27%，吨钢耗新水下降了80%
- 已经接近现有技术极限，未来进一步提高的潜力有限

中国重点钢铁企业的吨钢综合能耗



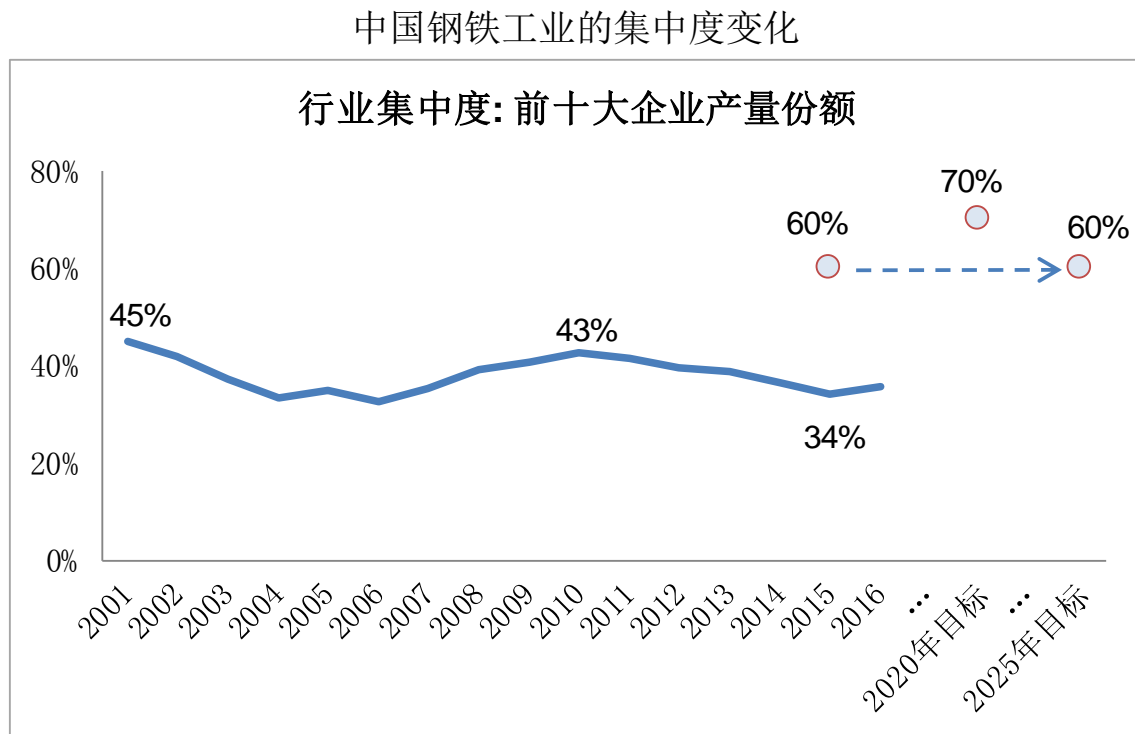
中国重点钢铁企业的吨钢耗新水量



数据来源：中国钢铁工业协会

# 中国钢铁工业的集中度仍然偏低

- 规模世界第一的中国钢铁工业，具有世界最低的行业集中度
- 2016年的现实与规划目标值相差甚远



数据来源: 中国钢铁工业协会, 世界钢铁协会

# 中国钢铁工业的结构调整需要解决三大问题

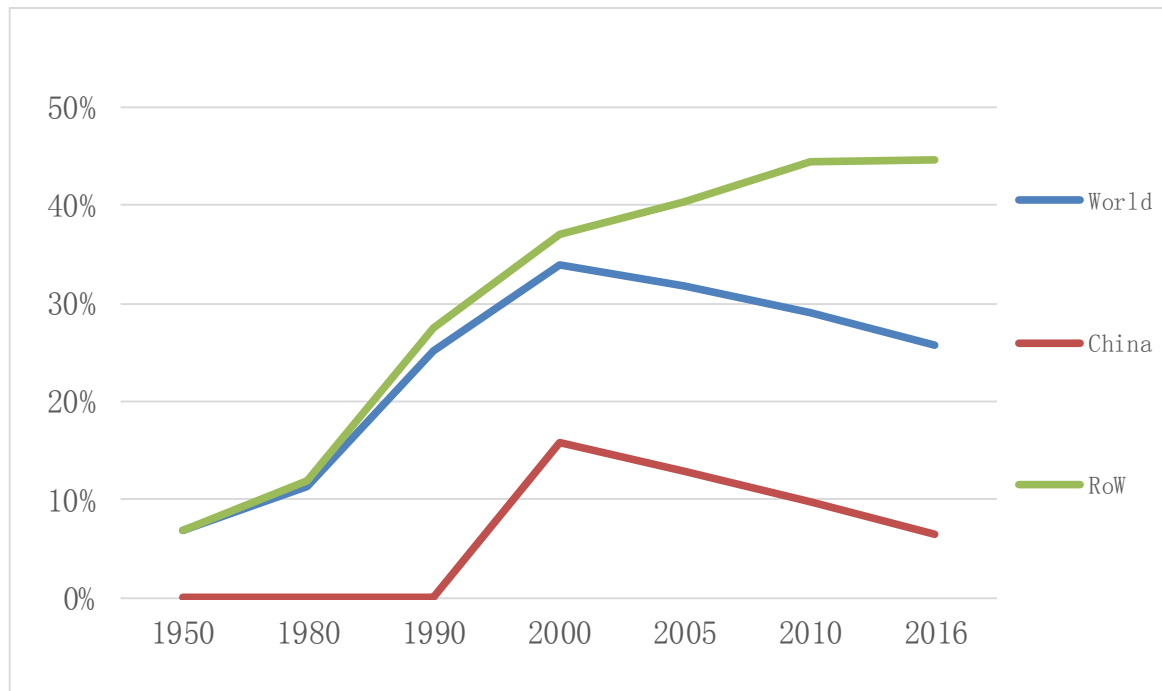
- 技术路线选择
- 钢厂地理分布
- 所有制改革

**技术路线选择：转炉 or 电炉**

# 电炉钢在世界钢产量中的比重因中国而下降

- 世界电炉钢比重上升的局面在2000后被扭转，中国因素导致比重持续下降
- 除中国外的其他国家电炉钢比重保持稳中有升的趋势
- 2030年左右电炉钢比重可能创历史新高

世界电炉钢产量比重变化

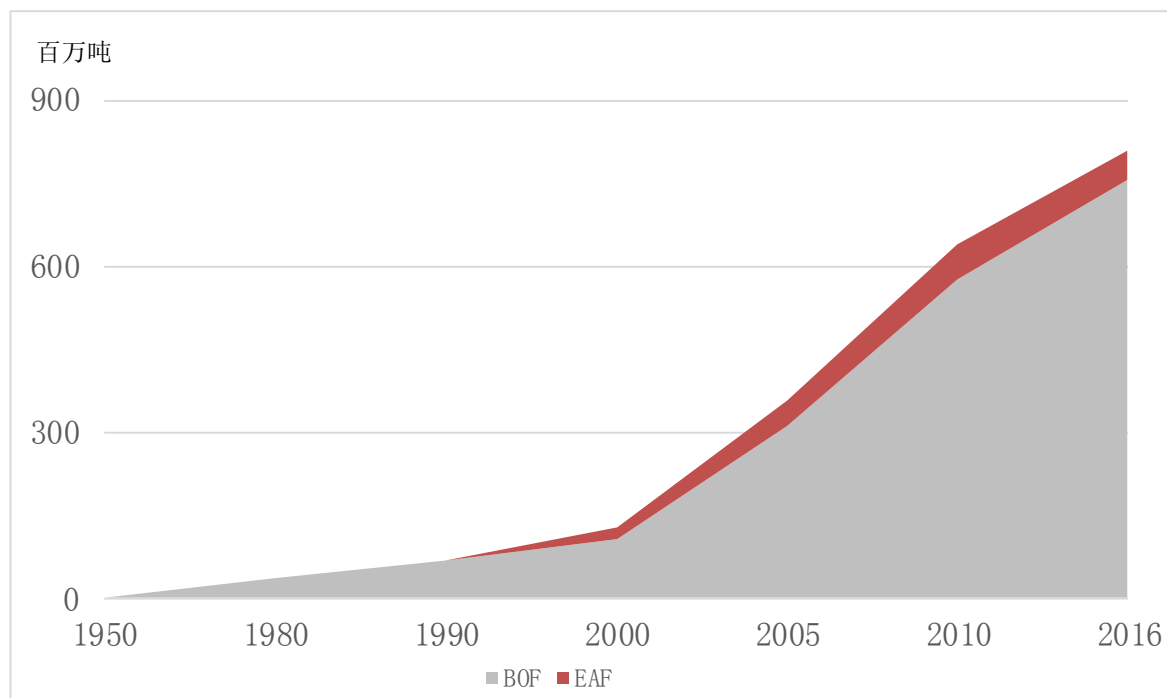


数据来源：世界钢铁协会

# 中国电炉钢的比重有待提高

- 中国电炉钢生产始于1990年代初，2003年后因高炉流程扩张迅速而比重下降
- 过去10年间，中国的钢产量增量100%来自转炉流程：高炉工艺成熟、电力紧缺、废钢不足导致电炉发展动力不足

中国转炉、电炉钢产量变化

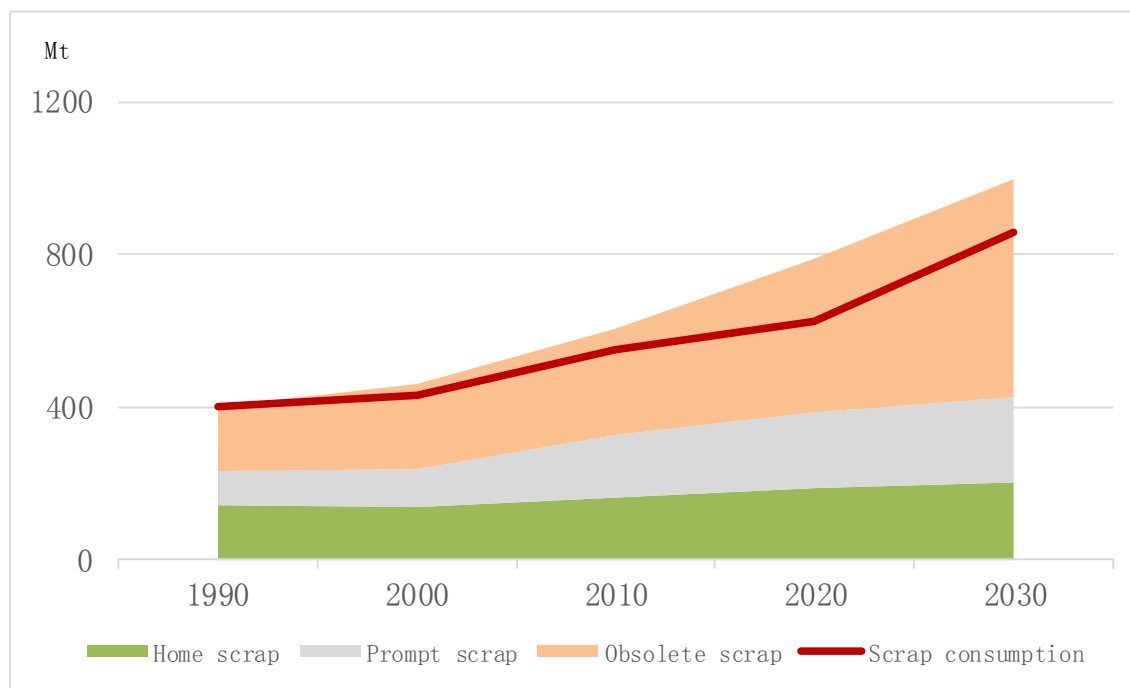


数据来源：世界钢铁协会

## 但是，未来全球废钢供应量将快速增长

- 全球废钢供应量稳步增长，消费量经过短暂波动后将快速上升
- 废钢的主要来源将为折旧废钢
- 废钢供应充足，可能局部过剩

全球废钢资源量与消费量变化



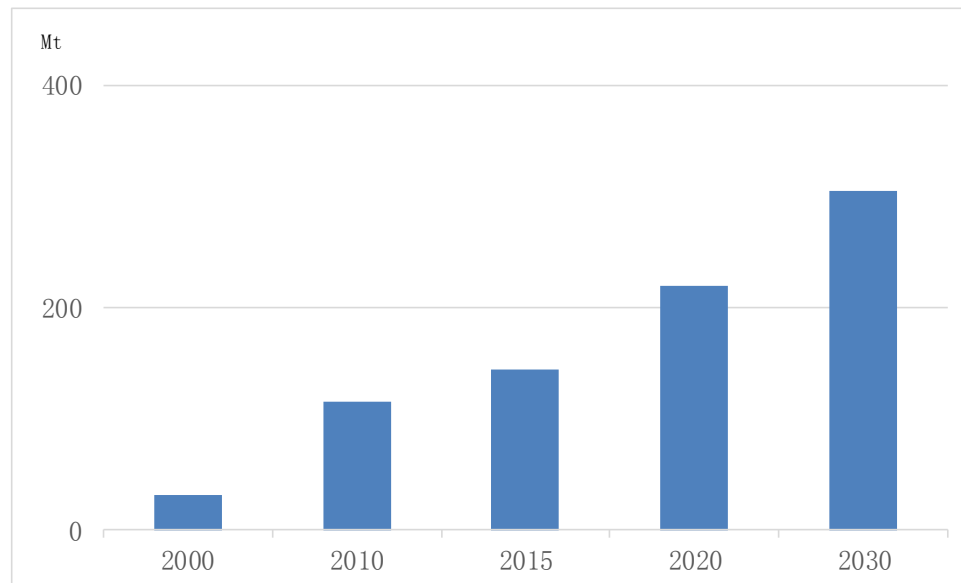
数据来源：世界钢铁协会



# 中国发展电炉炼钢的时机已经趋于成熟

- 废钢供应量充足，未来可能过剩
- 电力不再紧缺，部分地区过剩
- 环保压力，尤其是碳排放和水限制
- 转炉 or 电炉：因地制宜，视废钢资源和电力供应而定
- 中国式难题：高炉-转炉太新，尚未到更新换代时期，经济性是个问题
- 立足长远：需开发新一代的灵活工艺，可在铁矿石和废钢之间自由切换

中国废钢资源量变化



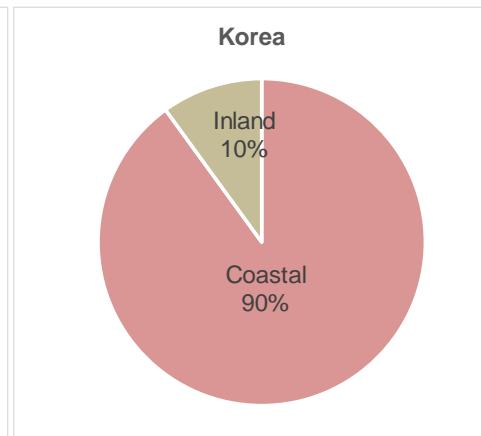
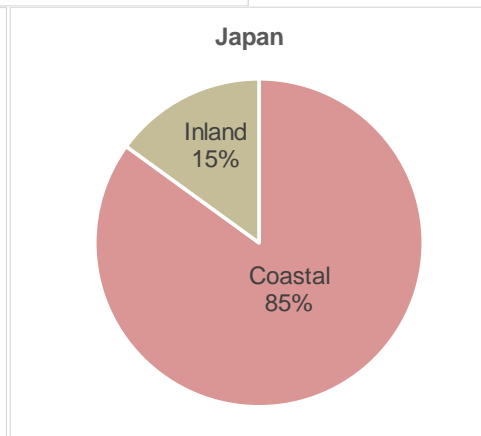
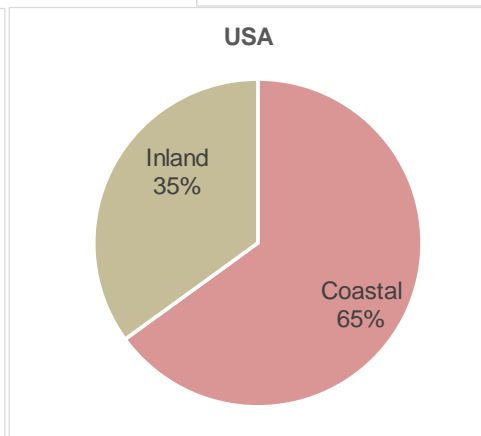
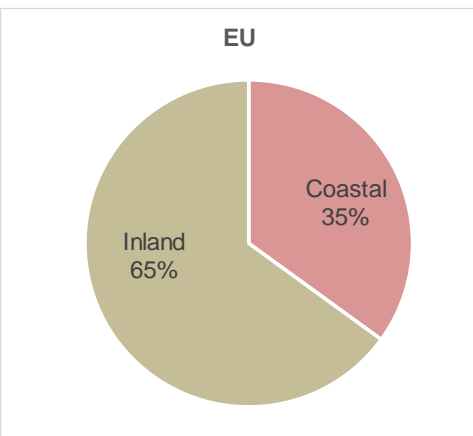
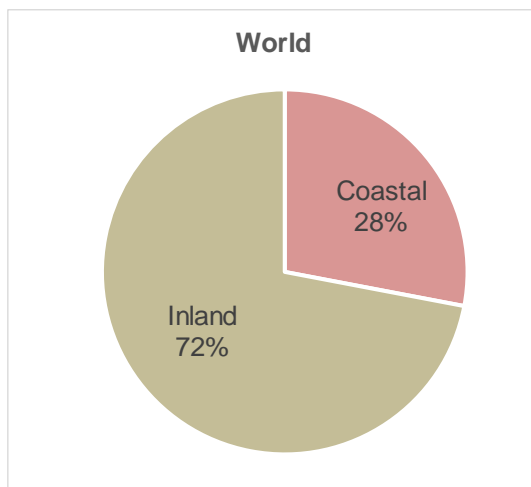
数据来源：世界钢铁协会

**钢厂分布：沿海 vs 内地，城区 vs 远郊**



# 在沿海地区建设钢铁基地是部分发达国家的成熟经验

- 紧邻沿海（沿湖）大型港口的钢铁产量比重：世界平均不到30%，日本和韩国最高

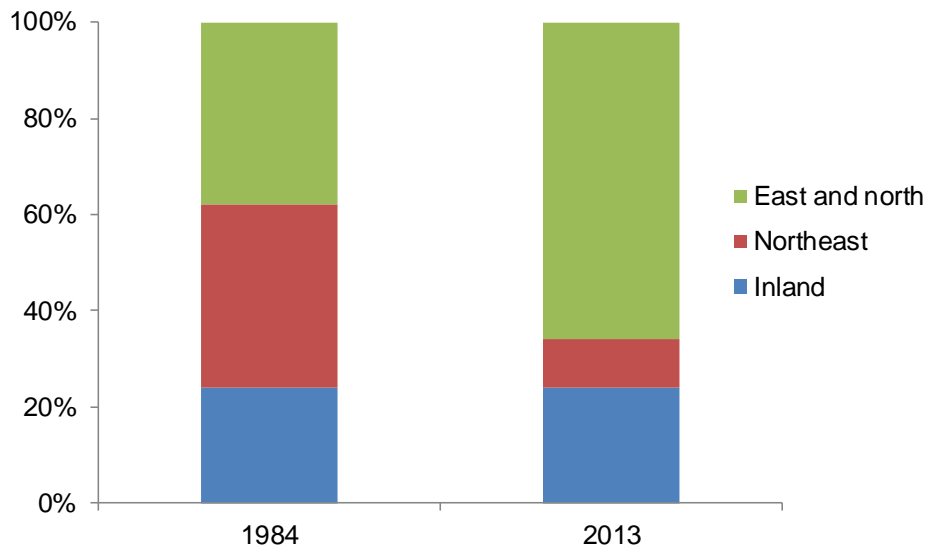


数据来源：根据资料估算

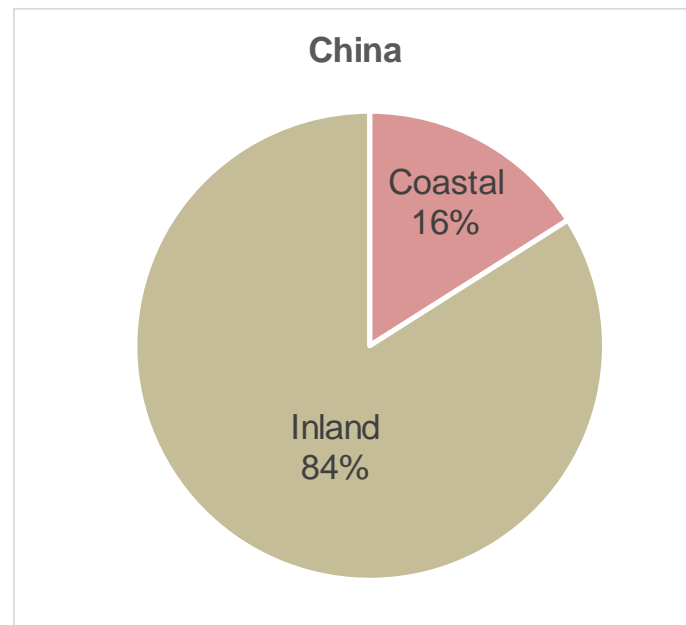
# 中国钢铁生产的重心正在向沿海转移

- 中国钢铁生产重心逐渐从资源枯竭的内陆转向东部沿海地带
- 临港企业的钢产量比重仍然不足20%

中国钢产量按地域比重变化



中国紧邻海港企业钢产量比重变化

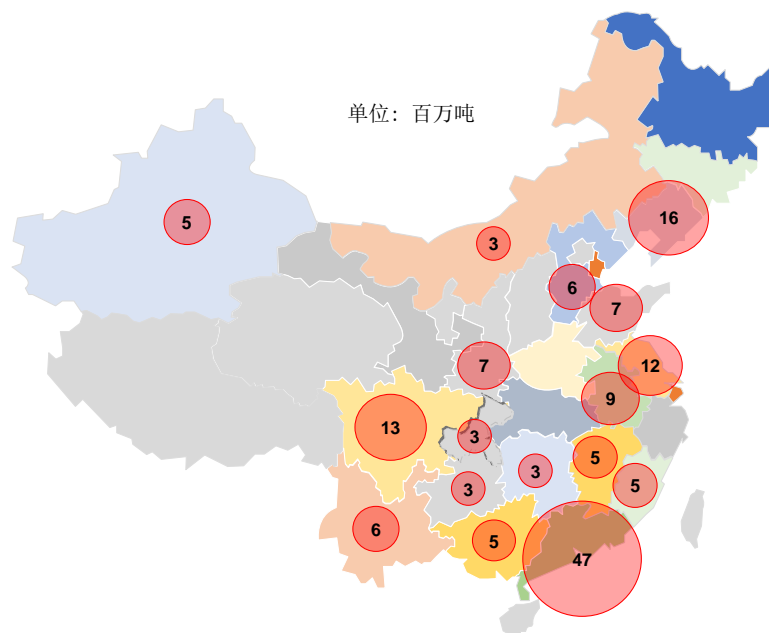


数据来源：根据资料估算

# 未来进一步向沿海集中？

- 不宜盲目，应视产品和规模而定
- 大型企业向沿海集中？
- 板材企业向沿海集中？
- 中小型、长材企业视下游情况而位于内陆/沿海？
- 淘汰地条钢地图：未来电炉钢发展的重点目标区域？

2016-17年淘汰地条钢的主要省区



数据来源：根据资料估算

# 城市钢厂：一定要搬迁吗？

- 位于城区的钢厂搬迁已经成为一个热点
- 搬迁本身只治标不治本
- 搬迁的成本可能大于收益，成功者寥寥无几
- 钢厂完全可以与城市和谐共生，成为经济和生活的帮手，而不是累赘
- 城市钢厂的搬迁正成为变相扩大产能的手段

钢铁是可持续性最强的功能材料！  
钢铁是发展循环经济的重要一环！



## 所有制改革：国有 vs 民营



# 其他国家钢铁工业的所有制变化

- 美国：基本不存在国有钢铁企业
- 日本：钢铁工业在早期以民营为主，二战前1933年民营企业被八幡制铁合并及国有化改造，战后1950年被强制分拆并民营化改造
- 韩国：早期以国有企业为主，2000年浦项实现私有化
- 欧洲：早期以民营企业为主，二战后被国有化改造，1988-1998年基本完成私有化改造，1998年欧盟国有钢铁企业的钢产量占总产量的比例已低于5%
  - 英国：19世纪初为国有，大战期间逐渐私有化，1951年部分实现国有化，1967年14家钢铁公司合并和国有化，1988年私有化，2016年几乎再度被国有化
  - 奥钢联2005年才完成私有化

# 国有钢铁企业集中在中国

- 2016年世界前50家钢铁企业中，18家为国有企业，16家为中国企业
- 50家企业产钢9.46亿吨，其中中国企业3.49亿吨，占37%

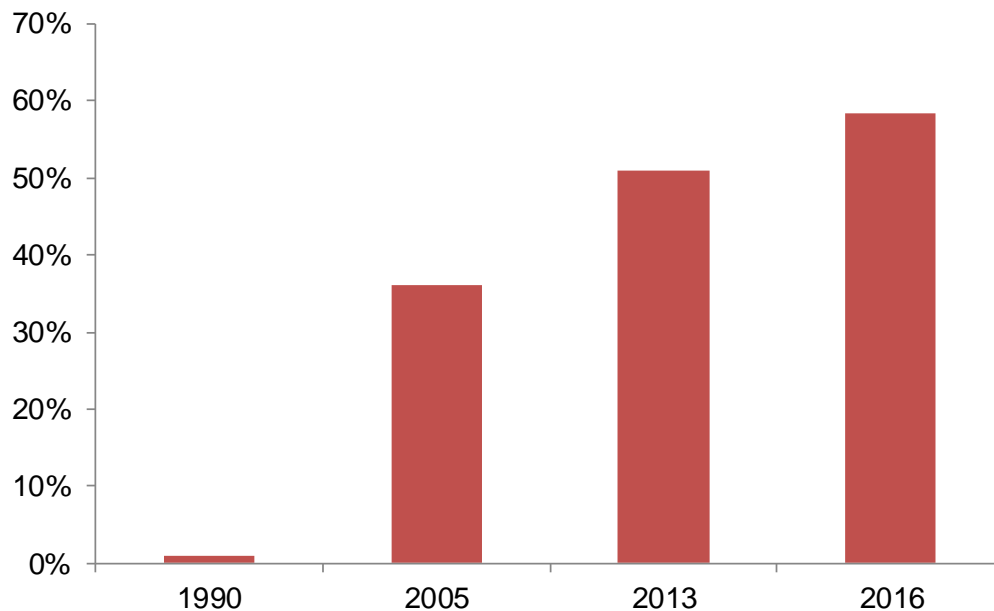
Rank	Company	2016 CSP	Rank	Company	2016 CSP
1	ArcelorMittal	95.45	26	Rizhao Steel	13.86
2	Baowu Group	63.81	27	Fangda Steel	13.68
3	HBIS Group	46.18	28	EVRAZ	13.53
4	NSSMC Group	46.16	29	MMK	12.54
5	POSCO	41.56	30	Baotou Steel	12.3
6	Shagang Group	33.25	31	Severstal	11.63
7	Ansteel Group	33.19	32	Liuzhou Steel	11.05
8	JFE	30.29	33	Jinxi Steel	11.05
9	Shougang Group	26.8	34	Jingye Steel	11.01
10	Tata Steel Group	24.49	35	Anyang Steel	10.48
11	Shandong Steel	23.02	36	Sanming Steel	10.39
12	Nucor	21.95	37	Metinvest	10.34
13	Hyundai Steel	20.09	38	Taiyuan Steel	10.28
14	Maanshan Steel	18.63	39	Zongheng	10.23
15	thyssenkrupp	17.24	40	Zenith Steel	9.24
16	NLMK	16.64	41	Erdemir	9.18
17	Jianlong Group	16.45	42	Nanjing Steel	9.01
18	Gerdau	15.95	43	Xinyu Steel	8.57
19	CSC	15.52	44	CITIC	8.4
20	Valin Group	15.48	45	SSAB	7.99
21	JSW Steel Limited	14.91	46	Techint	7.98
22	Benxi Steel	14.4	47	voestalpine	7.47
23	SAIL	14.38	48	Essar	7.45
24	U.S. Steel	14.22	49	Shaanxi Steel	7.3
25	IMIDRO	14.02	50	Kobe Steel	7.26

数据来源：世界钢铁协会

# 中国钢铁工业的所有制变化

- 中国民营钢铁企业的产量比重已经超过国有企业，占据主导地位，但话语权和影响力尚待增强
- 龙头民营钢铁企业正进入新的由量变到质变的发展阶段

中国民营钢铁企业钢产量比重变化



数据来源：全联冶金商会

# 建议

- 支持超大型国有企业，同时支持优秀的民营领军企业
- 做大做强国有资本与钢铁产业民营化不冲突
- 长期而言，民营化是不可阻挡的趋势



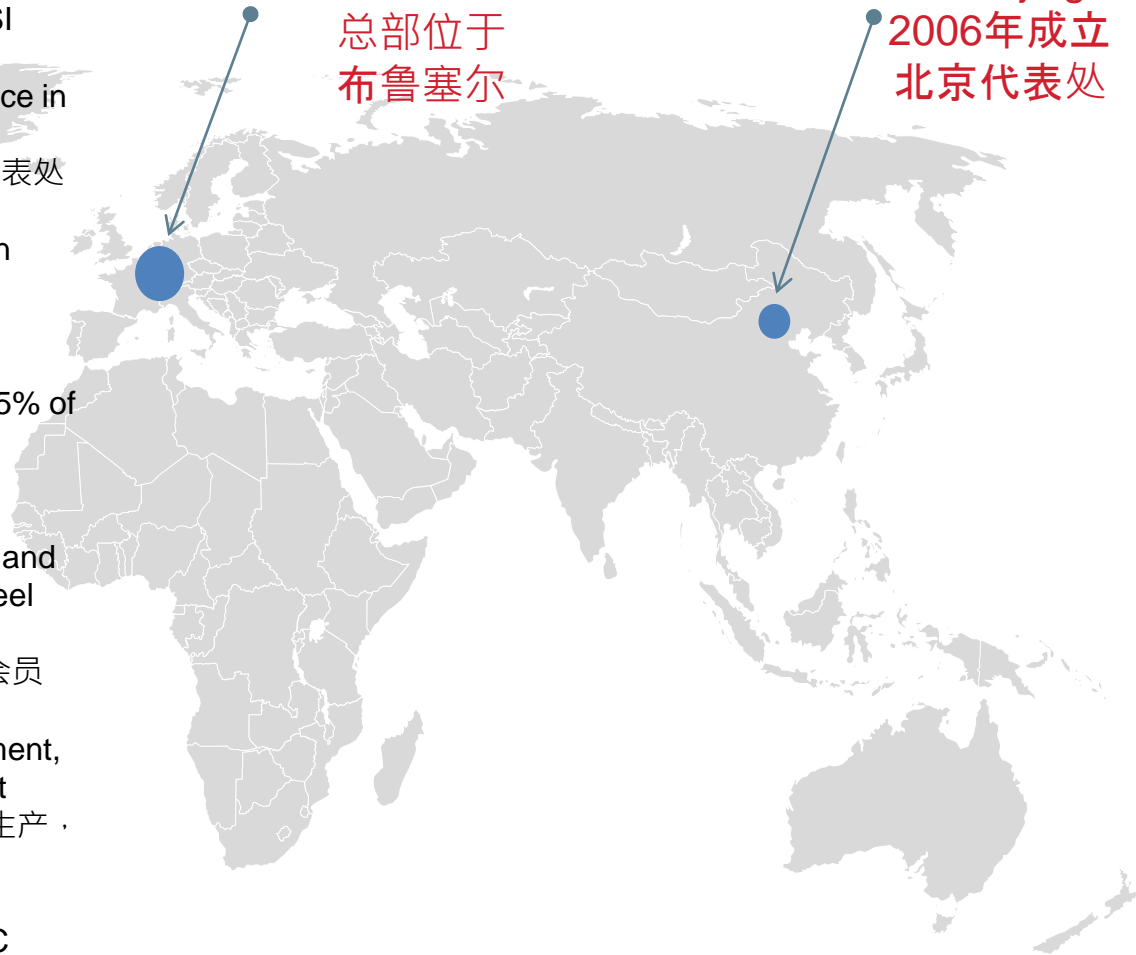
# About World Steel Association

## 世界钢铁协会简介

- Established as **International Iron and Steel Institute (IISI)** in 1967
  - 1967年成立，原名国际钢铁协会，简称IISI
- Headquartered in Brussels, with a second office in **Beijing**
- 总部位于比利时首都布鲁塞尔，在北京设立代表处
  - Name changed to **World Steel Association (worldsteel)** in 2008
  - 2008年英文名称更改，简写为 worldsteel
- Over 160 members worldwide, representing 85% of global steel production
  - 160多家会员单位，占全球钢产量85%
- 9 of the 10 largest steel companies, national and regional steel industry associations, and steel research institutes
- 全球10家最大钢铁企业中的9家已成为协会会员
- Main focus: economics, technology, environment, safety, sustainability, market development
- 主要工作领域：市场研究，技术，环境，安全生产，可持续发展，市场开发
  - Current Chairman: **Kosei Shindo, NSSMC**
  - 现任会长：新日铁住金柱式会社社长 进藤孝生

Head office  
in Brussels  
总部位于  
布鲁塞尔

2<sup>nd</sup> office  
in Beijing  
2006年成立  
北京代表处



Thank you for your attention.

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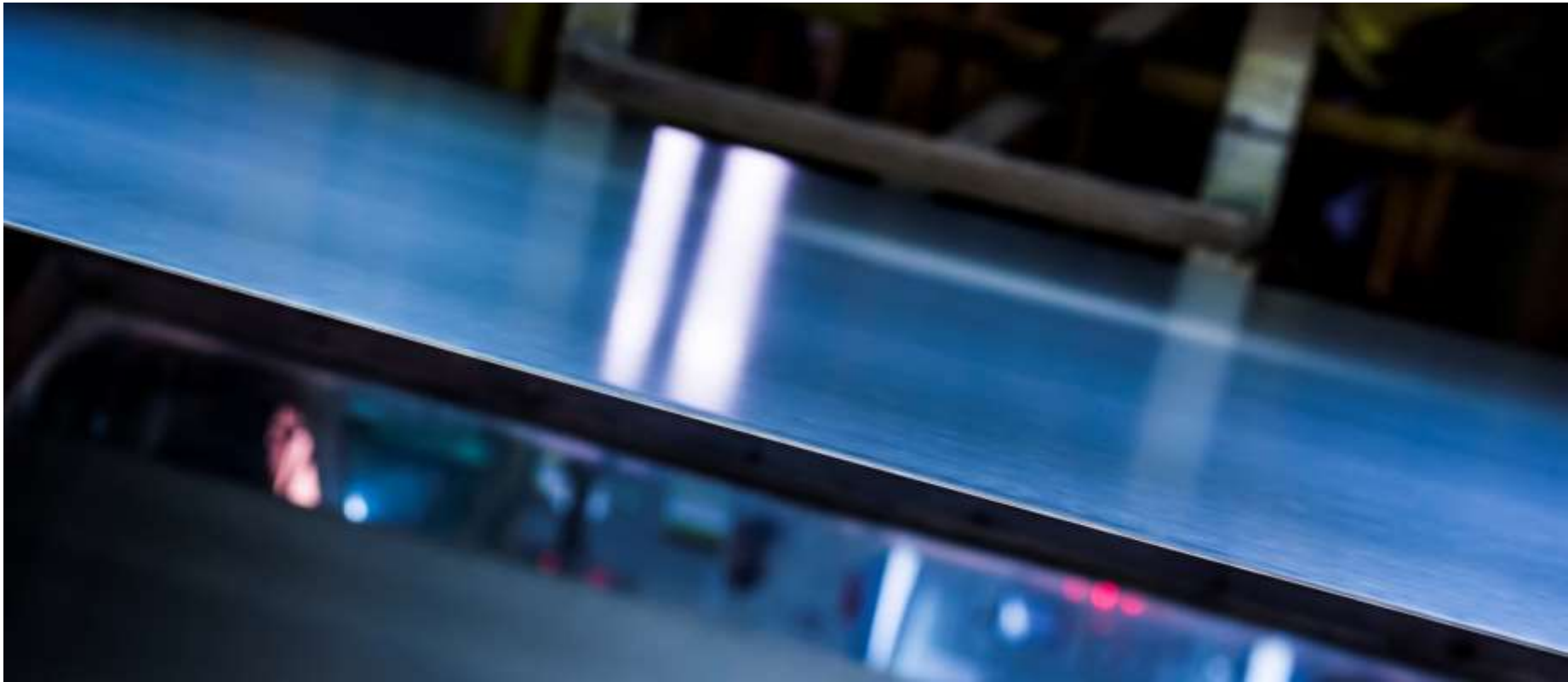
# worldsteel

A S S O C I A T I O N

[worldsteel.org](http://worldsteel.org)

# The Chinese steel industry at a crossroads

Frank Zhong, World Steel Association - China Iron Ore 2018, Beijing





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# Contents

- Overview of the Chinese steel industry
- Technology route: BOF vs EAF
- Location: coastal vs inland, urban vs rural
- Ownership: SOE vs Private

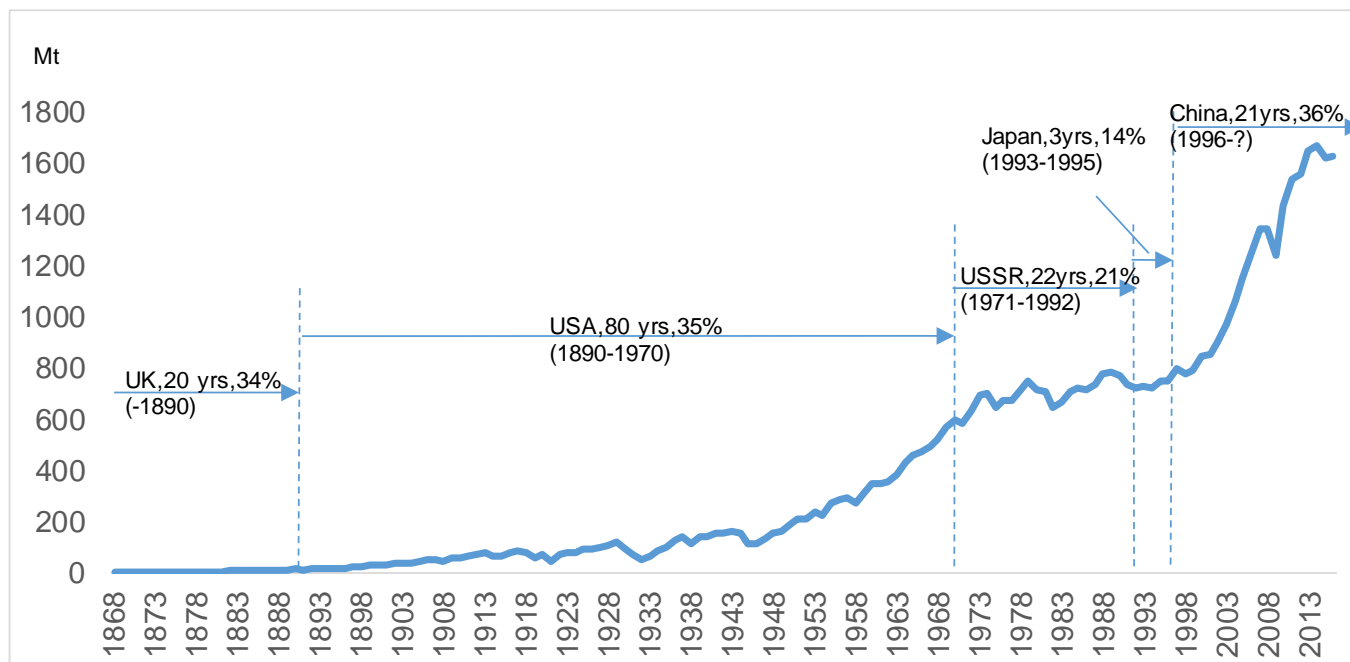
## **Overview of the Chinese steel industry**



# Global steel industry in transformation

- General view about global steel industry development:
  - The industry is facing the next big change: strong players becoming stronger, emerging players, disruptors, declining of some established players, steel production to concentrate in one region
  - No other countries will be able to replace China's role in a foreseeable future

**Global Crude Steel Production and No.1 Producer's Share**

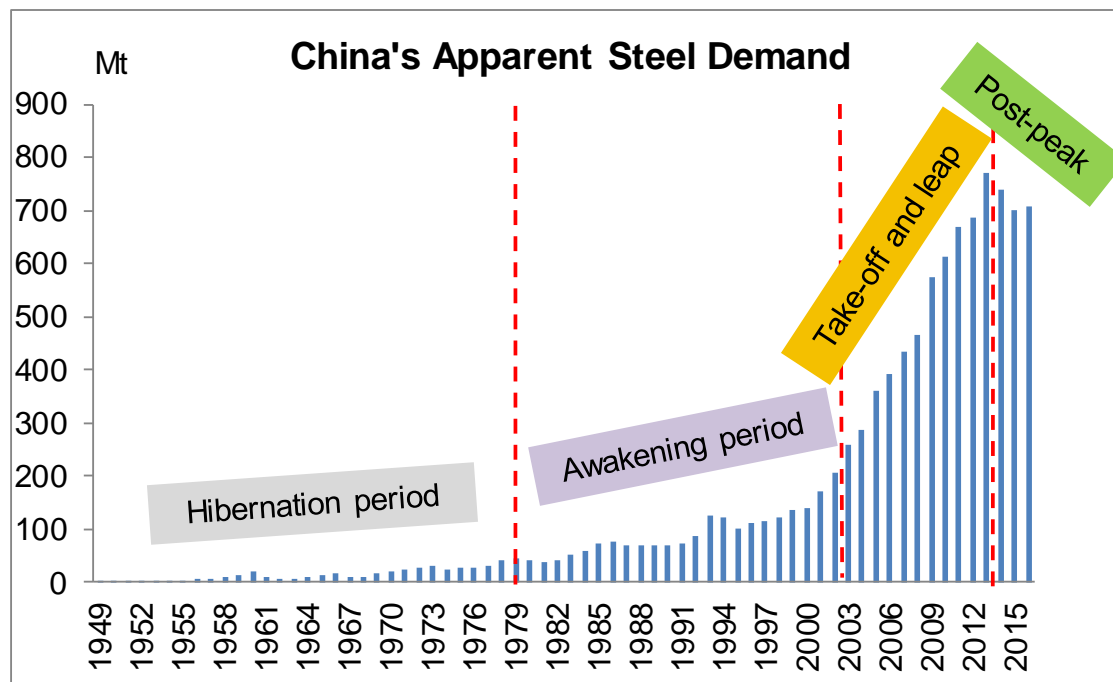


Source: worldsteel

# China's steel industry has entered post-peak era

- China's steel industry development is divided into four phases in the context of the economic development
- We are now at post-peak era after a short period of take-off period, the time of high-speed growth is now over

## 4-Phased Development of the Chinese Steel Industry

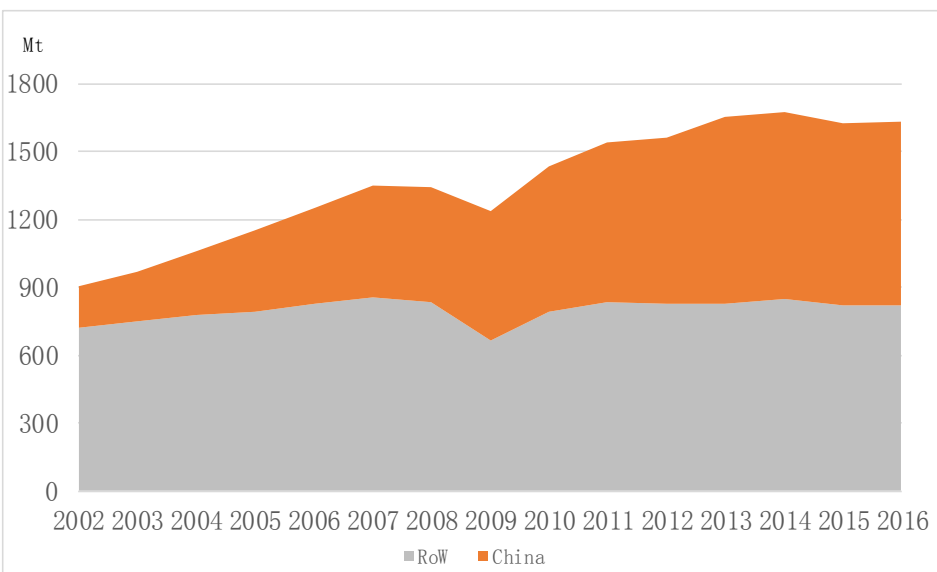


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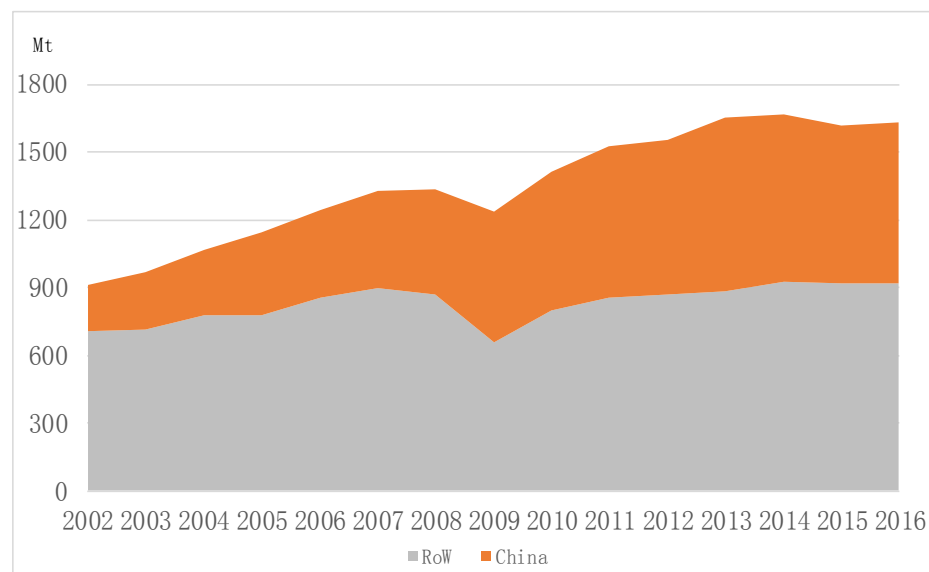
# China plays a core role in global steel industry

- Steel production and consumption in RoW grew by only 14% and 30% in the past 15 years, while China's jumped by 3.4 times and 2.4 times, respectively
- China accounts for 86% of the world's increase in steel production and 70% in consumption

## Crude Steel Production: China vs RoW



## Apparent Steel Consumption: China vs RoW

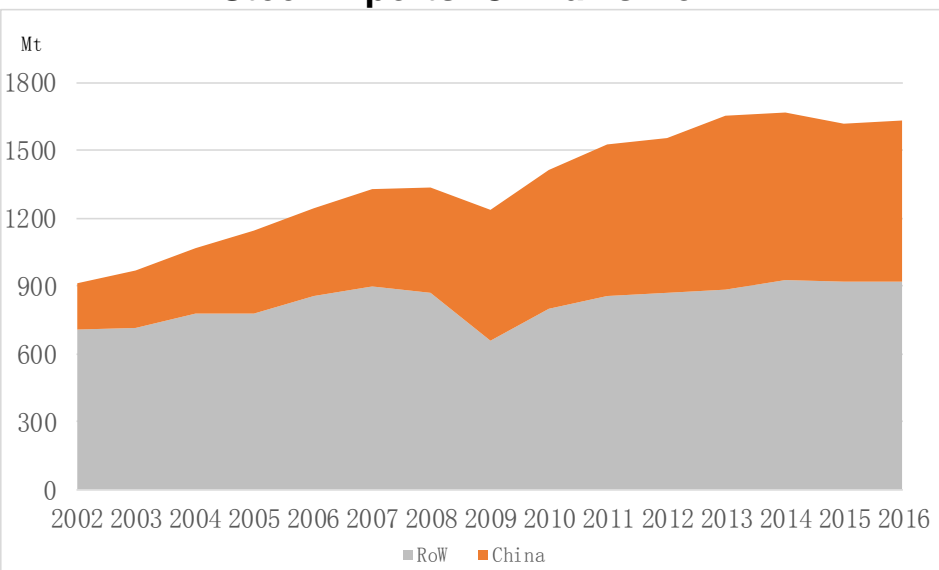


Source: worldsteel

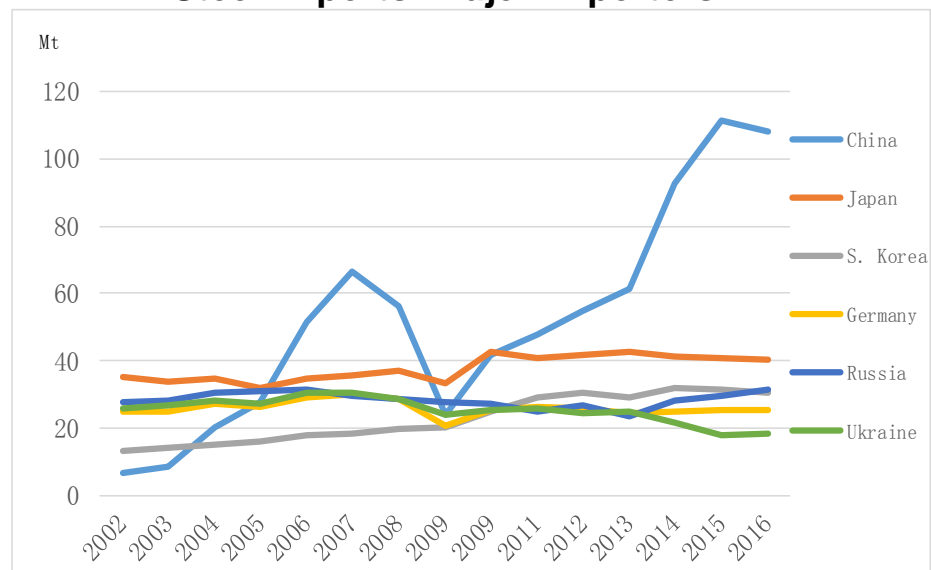
# China is a key player in global steel trade

- Steel exports from RoW grew by only 17% or 53.8 Mt in the past 15 years, while China's jumped by 15.3 times of 101 Mt
- China contributed 65% of the increase in the world's steel exports

## Steel Exports: China vs RoW



## Steel Exports: Major Exporters

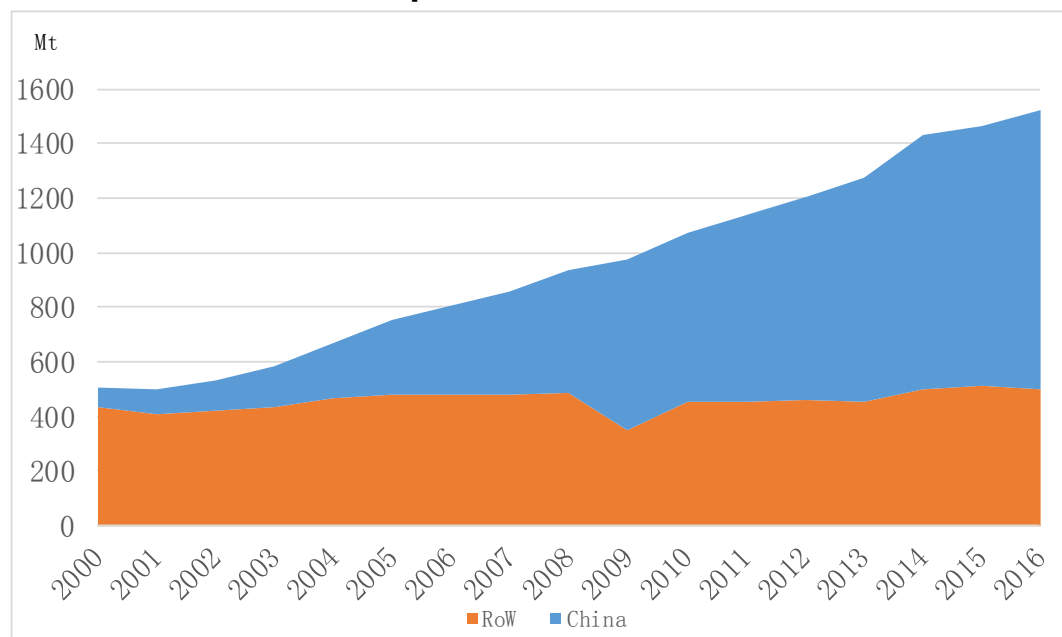


Source: worldsteel

# China is the only driver in global iron ore market

- Global iron ore trade increased by 1020 Mt in the past 15 years, of which 94% or 950 Mt from China, while RoW's iron ore imports grew by only 15% or 65 Mt
- More than 95% of China's new steel capacities are BF-BOF route

Iron Ore Imports: China vs RoW



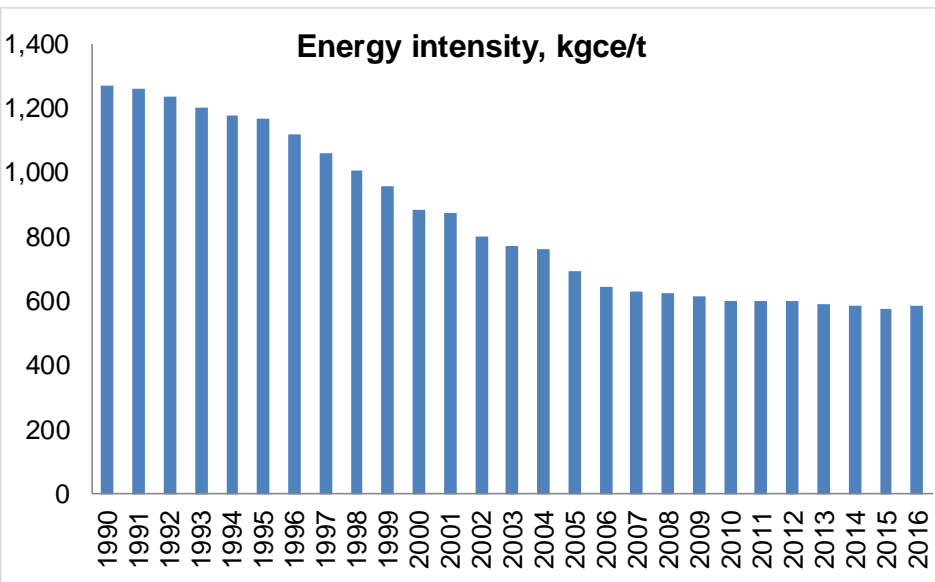
Source: worldsteel



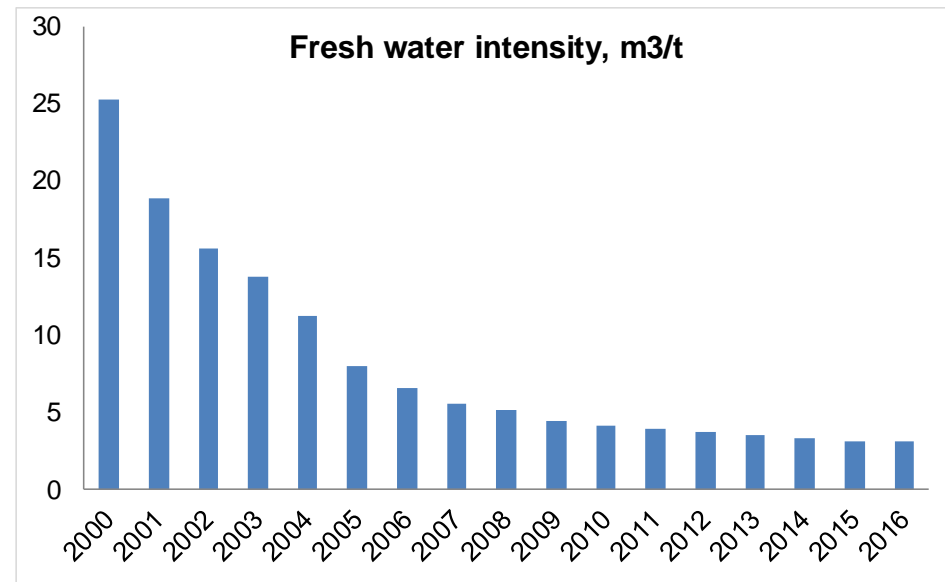
# Dramatic improvement in environmental performance

- Energy intensity of mid-large steel mills declined by 27% in the past 15 years, while fresh water intensity dropped by 80%
- Not much potential for radical improvement, as it's approaching technical limits of the existing technologies

## Energy Efficiency Improvement



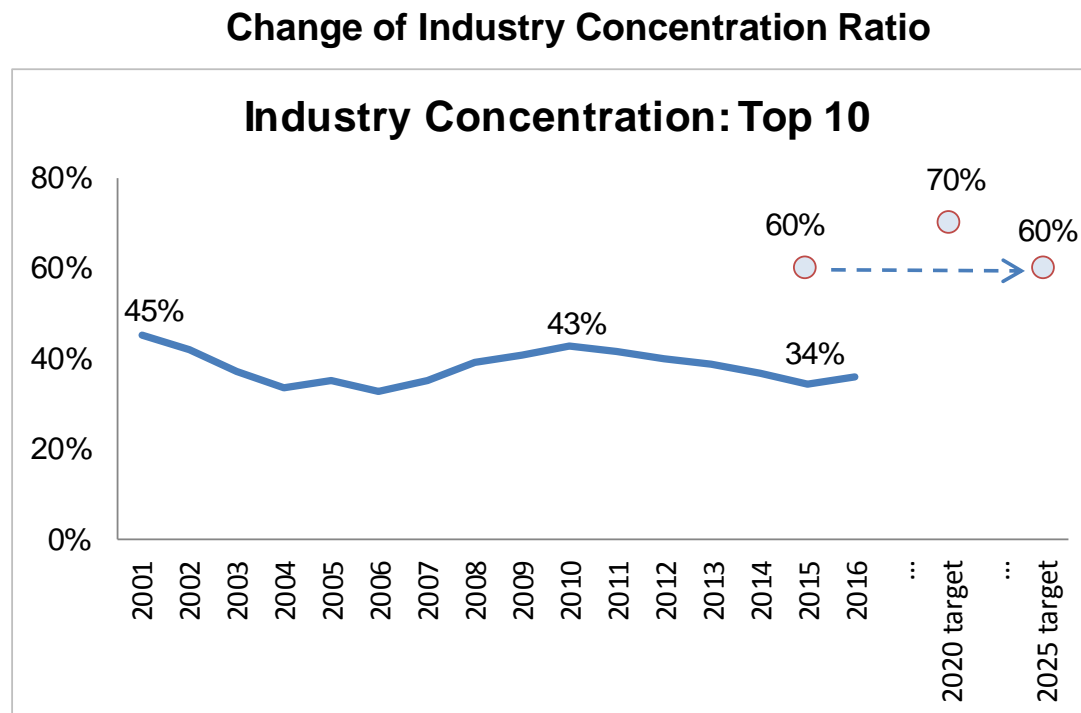
## Water Efficiency Improvement



Source: CISA

# Industry concentration is still low

- The largest steel producing country has the lowest industry concentration ratio
- The actual concentration ratio is far from the government's target



Source: CISA, worldsteel

# Three strategic issues to be addressed

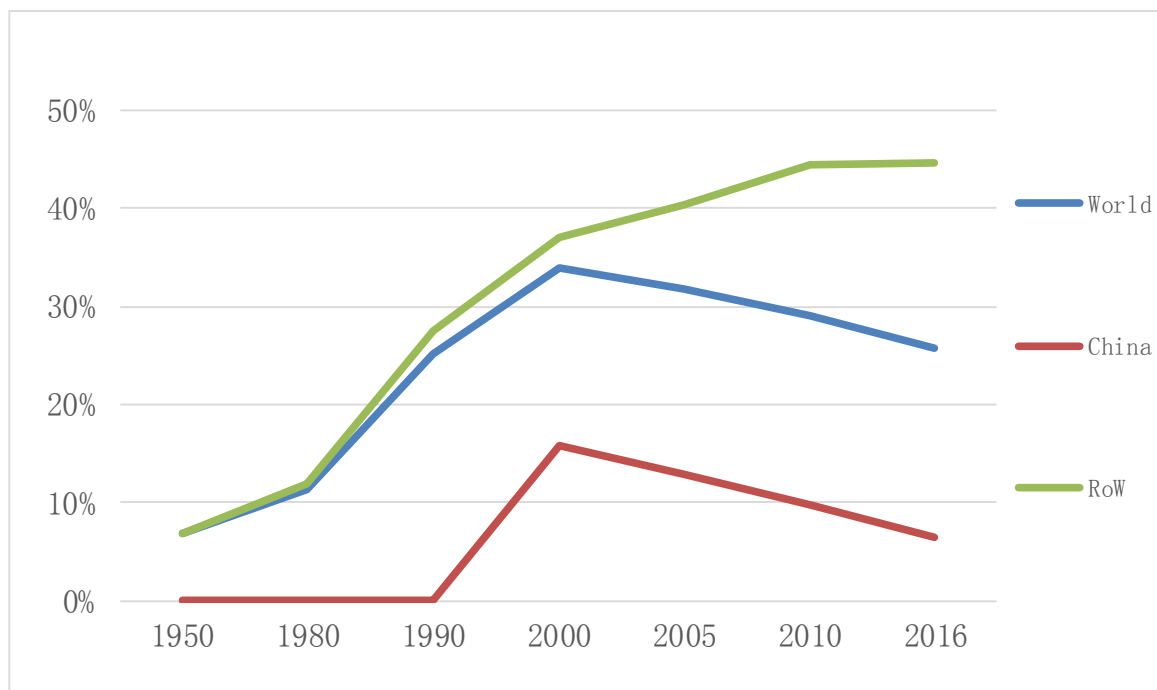
- Technology route: BOF vs EAF
- Geographical location of mills
- Ownership: SOE vs Private

## **Technology route: BOF vs EAF**

# China drives EAF's production share down

- The rising trend of EAF's share in global steel production was changed by China since 2000
- EAF's share in RoW remains rising
- EAF's share in global steel production may post a new high by 2030

Share of EAF's Production

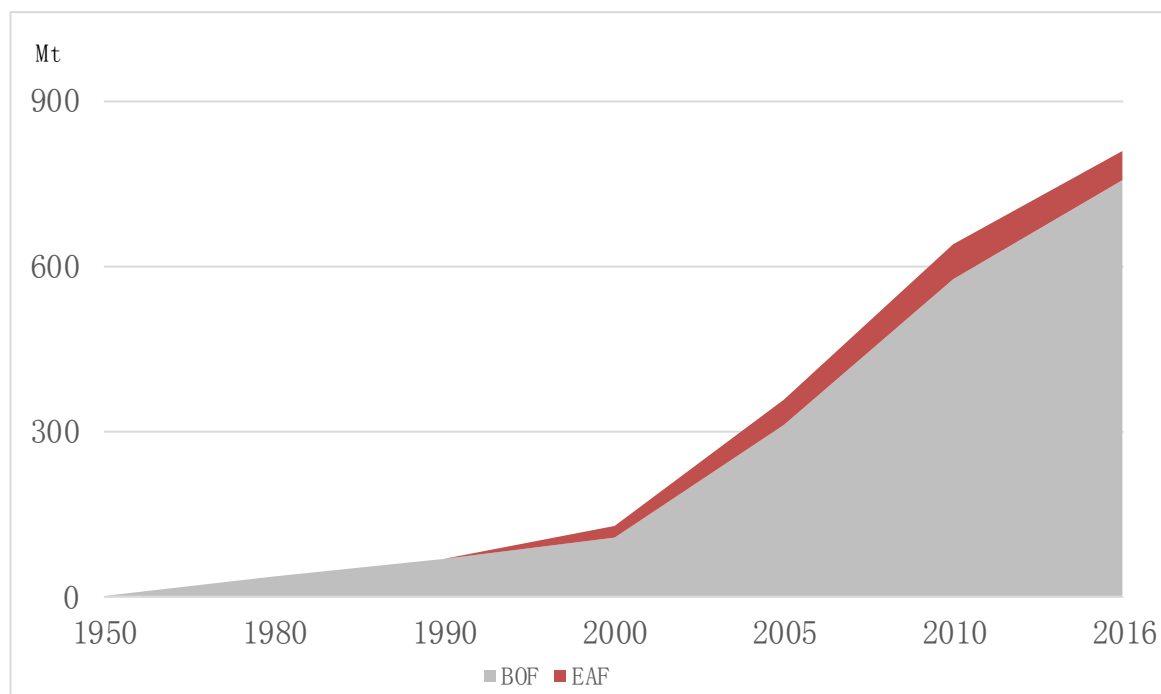


Source: worldsteel

# China's EAF share to be improved

- China began EAF production in the early 1990s, but its share shrank quickly from 2003 for fast expansion of BF's
- 100% of China's steel production increase was from BF-BOF route in the past 10 years: mature BF, tight supply of power and scrap

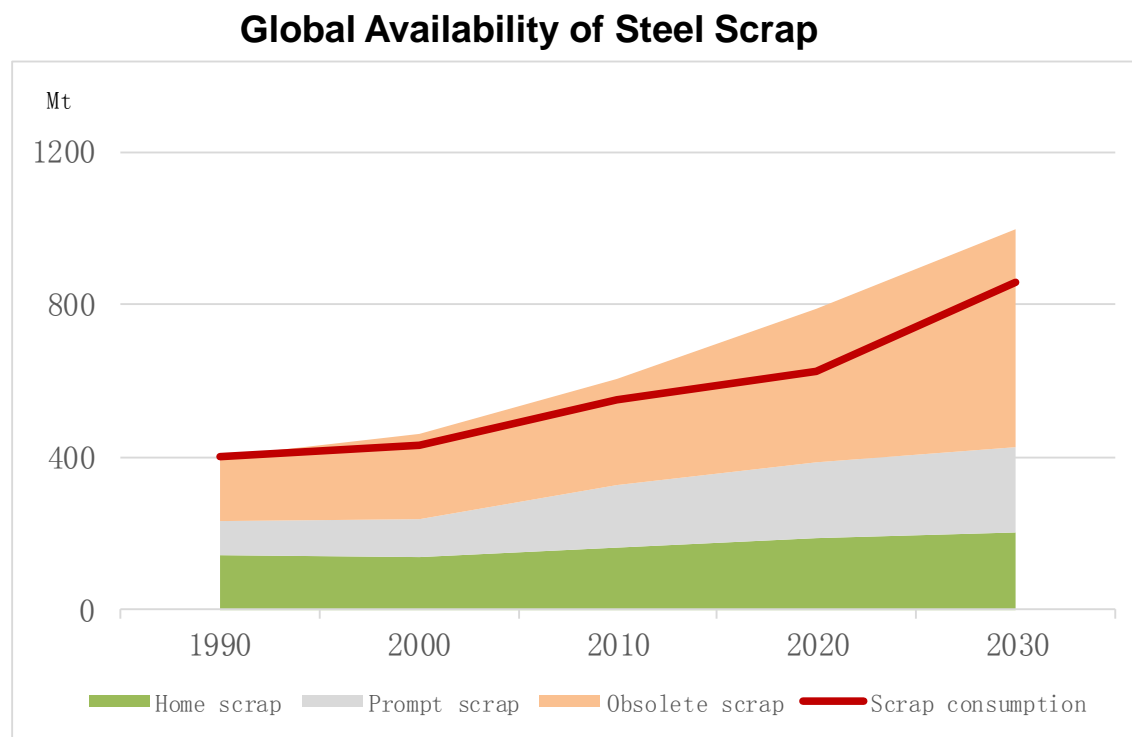
China's Crude Steel Production: BOF vs EAF



Source: worldsteel

# But, global scrap supply to grow fast in the near future

- Global steel supply on rising, scrap consumption to increase after a short break
- Obsolete scrap to become a major source of scrap supply
- Scrap to be abundant with oversupply in some regions

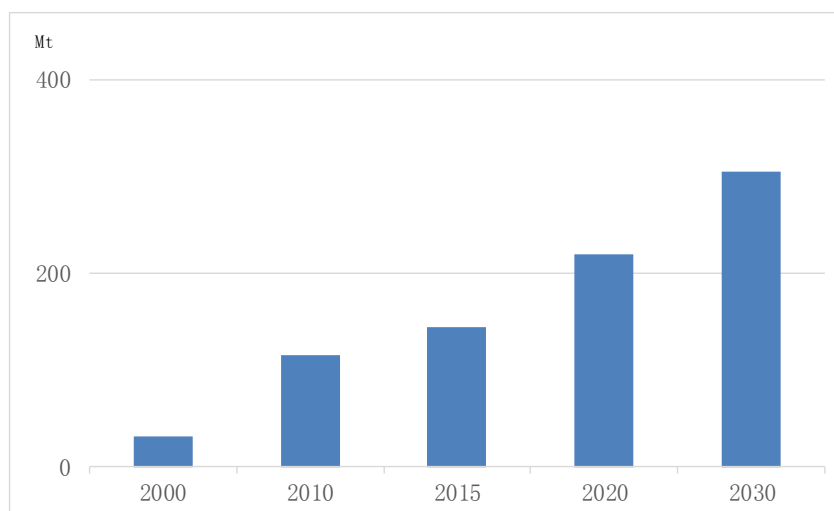


Source: worldsteel

# Right time for China to use more EAF

- Scrap supply set to be sufficient, possible oversupply in the future
- Electricity supply no longer tight, oversupply in some regions
- Environmental pressure, especially carbon and water limits
- BOF or EAF: case by case, depending on scrap and power supply
- China's issue: BF-BOF capacities too new to replace, limited economic value of replacement with EAF
- Longer term: need to develop next generation technology to use both iron ore and scrap in a flexible manner

**China's Availability of Steel Scrap**



Source: worldsteel

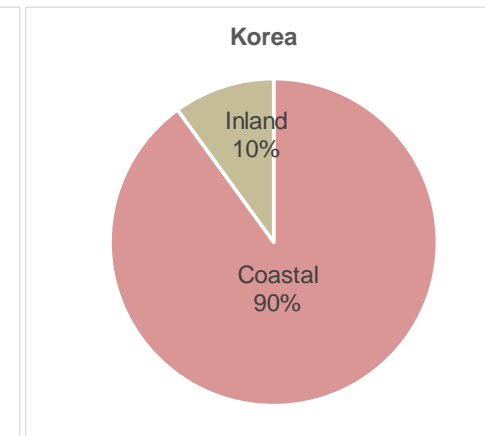
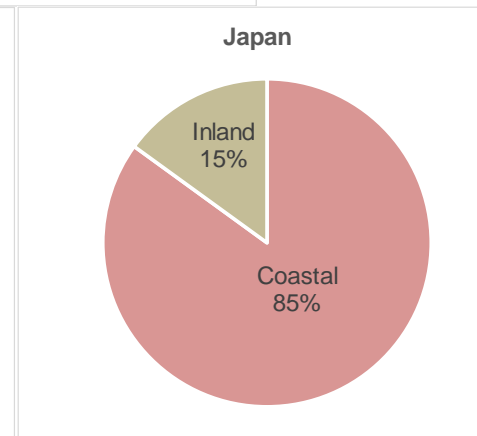
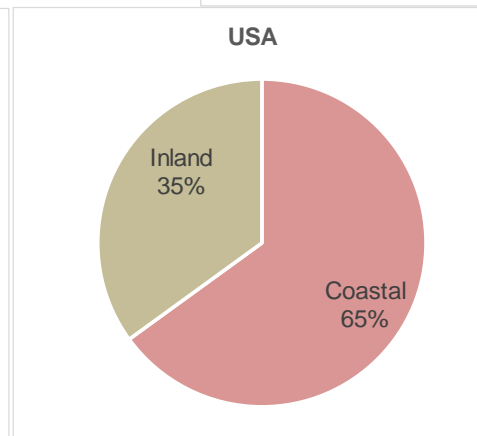
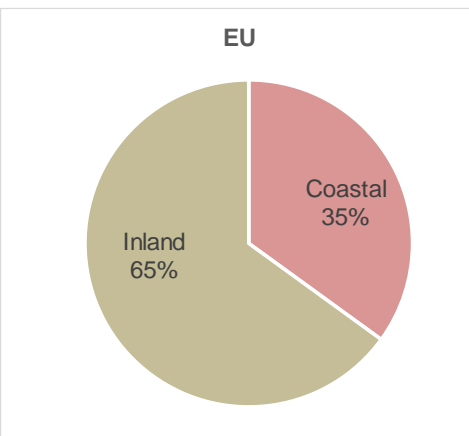
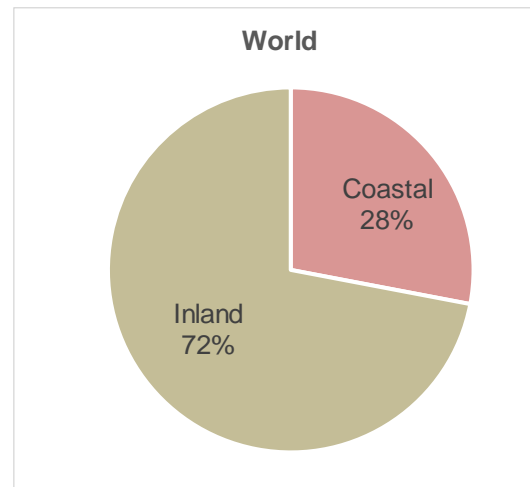


**Location: coastal vs inland, urban vs rural**



# Locating steel mills in coastal areas is a common practice

- Share of steel production in coast/lakeside: world average 30%, higher in Japan and South Korea

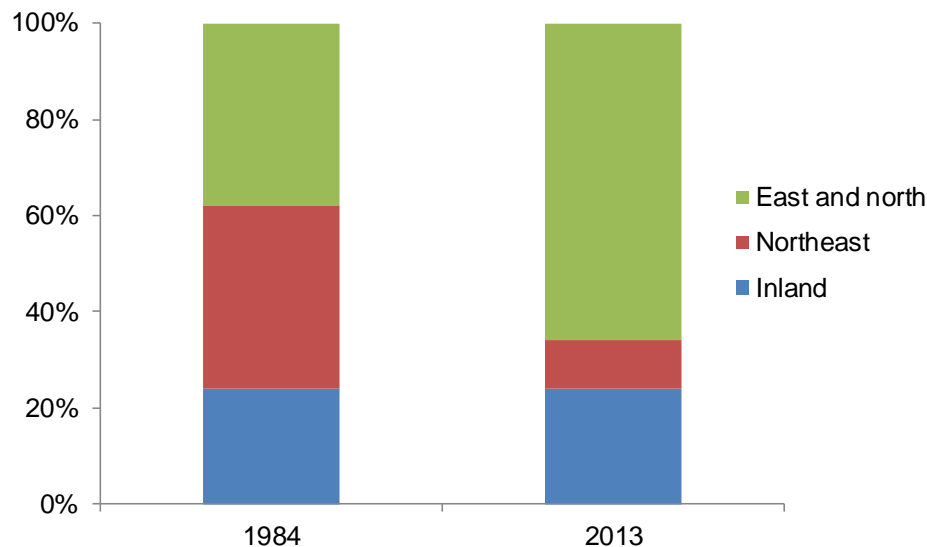


Source: estimates

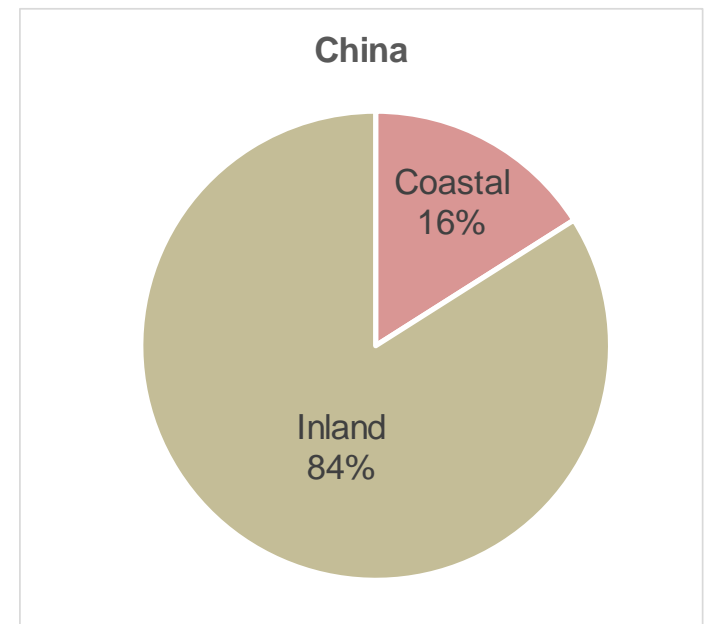
# Gravity of China's steel production moving to coast

- Gravity of China's steel production has been moving from inland regions to east and coastal areas
- Port-side steel plants' share still below 20%

## Regional Share of Steel Production



## Location of Steel Production: Coastal vs Inland

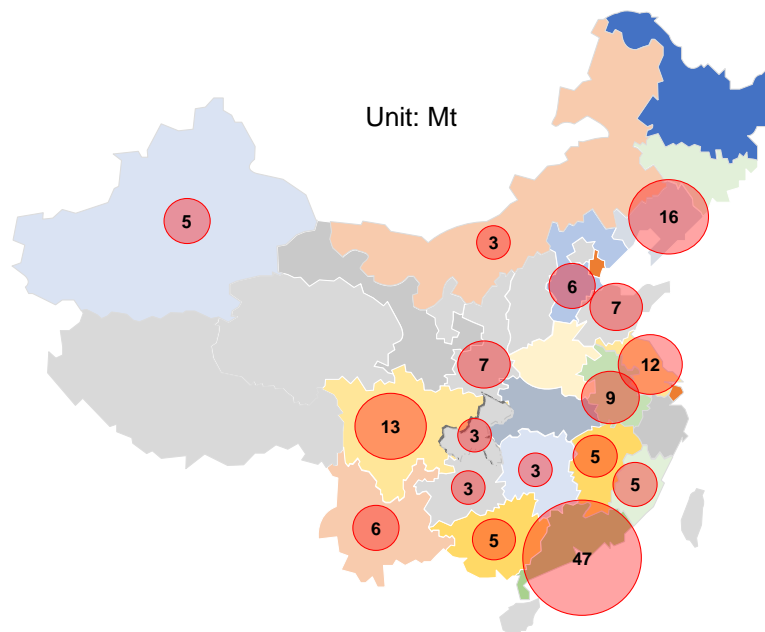


Source: estimates

# Move more to coast?

- Case by case, depending on capacity and product mix
- Large mills move to concentrate on coast?
- Flat mills move to coast?
- Medium-small mills, longs producers to locate in inland/coast?
- IF's closure: indication for future location of EAF development?

## IF's Capacity Closure in Major Regions



Source: estimates

# Urban mills: relocation inevitable?

- Relocation of urban mills becomes a hot topic
- Relocation does not solve all problems
- Cost of relocation can be higher than return, few successful cases
- Steel mills can get along well together with local communities, as a part of solution to the economy and society, rather than a problem
- Relocation of urban mills becomes an opportunity to expand capacity?

Steel is the most **sustainable** material!  
Steel is a **solution** to Circular Economy!



## **Ownership: SOE vs Private**



# Ownership changes in other countries

- USA: no SOE steel mills existing
- Japan: private mills in earlier time, nationalization in 1933 for the wars, privatization again in 1950
- South Korea: SOE in earlier time, POSCO privatized in 2000
- Europe: private mills in earlier time, nationalization after war, privatization again in 1988-1998 (SOE's share <5% in 1998)
  - UK: SOE in early 1900s, privatization in wars, partly nationalization in 1951, full nationalization in 1967, British Steel privatized again in 1988, almost nationalized again in 2016
  - woestalpine: privatization started in 1995 and finished in 2005



# Most SOE steel companies are in China

- Top 50 steel companies in 2016: 18 SOE's, 16 in China
- Top 50 produced 946 Mt, of which SOE 349 Mt or 37%

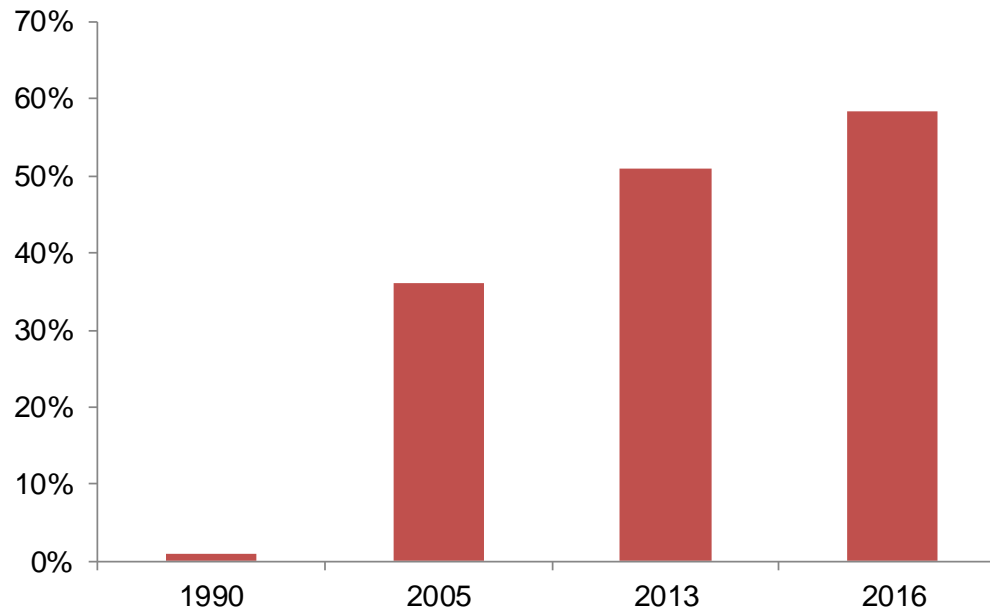
Rank	Company	2016 CSP	Rank	Company	2016 CSP
1	ArcelorMittal	95.45	26	Rizhao Steel	13.86
2	Baowu Group	63.81	27	Fangda Steel	13.68
3	HBIS Group	46.18	28	EVRAZ	13.53
4	NSSMC Group	46.16	29	MMK	12.54
5	POSCO	41.56	30	Baotou Steel	12.3
6	Shagang Group	33.25	31	Severstal	11.63
7	Ansteel Group	33.19	32	Liuzhou Steel	11.05
8	JFE	30.29	33	Jinxi Steel	11.05
9	Shougang Group	26.8	34	Jingye Steel	11.01
10	Tata Steel Group	24.49	35	Anyang Steel	10.48
11	Shandong Steel	23.02	36	Sanming Steel	10.39
12	Nucor	21.95	37	Metinvest	10.34
13	Hyundai Steel	20.09	38	Taiyuan Steel	10.28
14	Maanshan Steel	18.63	39	Zongheng	10.23
15	thyssenkrupp	17.24	40	Zenith Steel	9.24
16	NLMK	16.64	41	Erdemir	9.18
17	Jianlong Group	16.45	42	Nanjing Steel	9.01
18	Gerdau	15.95	43	Xinyu Steel	8.57
19	CSC	15.52	44	CITIC	8.4
20	Valin Group	15.48	45	SSAB	7.99
21	JSW Steel Limited	14.91	46	Techint	7.98
22	Benxi Steel	14.4	47	voestalpine	7.47
23	SAIL	14.38	48	Essar	7.45
24	U.S. Steel	14.22	49	Shaanxi Steel	7.3
25	IMIDRO	14.02	50	Kobe Steel	7.26

Source: worldsteel

# Ownership change in the Chinese steel industry

- Private mills' production share has surpassed SOE's, while power of influence is still improving
- Leading private steelmakers are transforming from quantity-driven to quality-focused business strategy

Share of Private Mills' Steel Production



Source: CCCME

# Advice

- Government should support both giant SOE and leading private mills
- Privatization of steel industry does not conflict with government's guidance "Making SOE Capital Larger and Stronger"
- Longer term: privatization of steel industry is inevitable for efficiency improvement



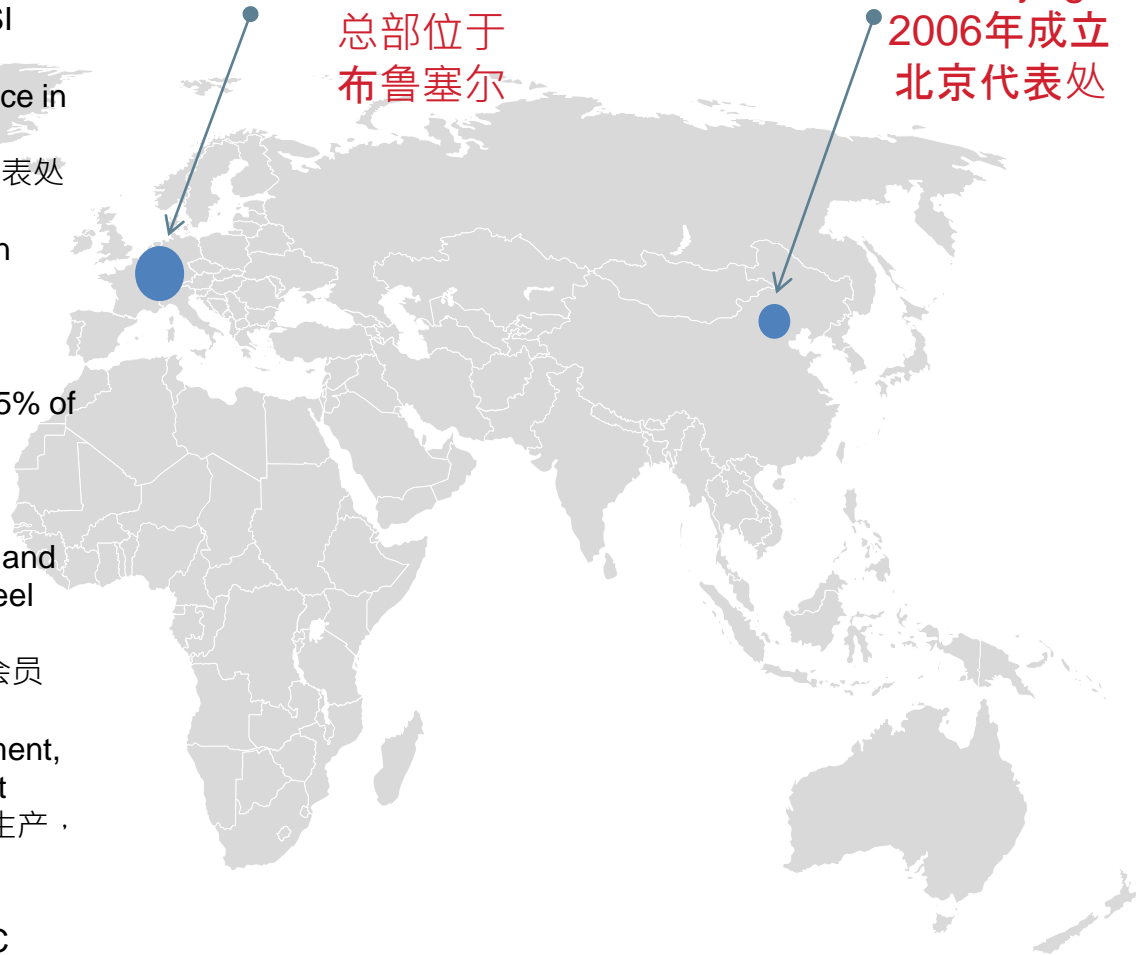
# About World Steel Association

## 世界钢铁协会简介

- Established as **International Iron and Steel Institute (IISI)** in 1967
  - 1967年成立，原名国际钢铁协会，简称IISI
- Headquartered in Brussels, with a second office in **Beijing**
- 总部位于比利时首都布鲁塞尔，在北京设立代表处
  - Name changed to **World Steel Association (worldsteel)** in 2008
  - 2008年英文名称更改，简写为 worldsteel
- Over 160 members worldwide, representing 85% of global steel production
  - 160多家会员单位，占全球钢产量85%
- 9 of the 10 largest steel companies, national and regional steel industry associations, and steel research institutes
- 全球10家最大钢铁企业中的9家已成为协会会员
- Main focus: economics, technology, environment, safety, sustainability, market development
- 主要工作领域：市场研究，技术，环境，安全生产，可持续发展，市场开发
  - Current Chairman: **Kosei Shindo, NSSMC**
  - 现任会长：新日铁住金柱式会社社长 进藤孝生

Head office  
in Brussels  
总部位于  
布鲁塞尔

2<sup>nd</sup> office  
in Beijing  
2006年成立  
北京代表处



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