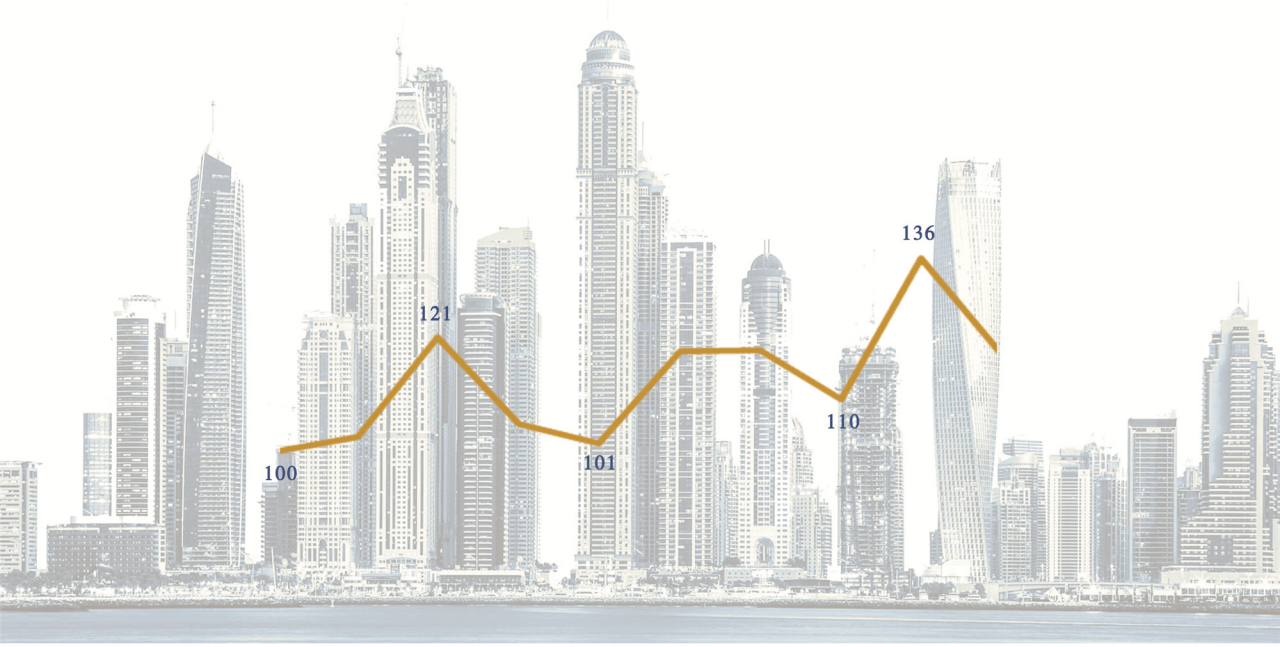
BRIDI

“一带一路”国家基础设施发展指数报告

The Belt and Road Infrastructure Development Index Report

2017



中国对外承包工程商会
CHINA INTERNATIONAL CONTRACTORS ASSOCIATION

技术支持 Technical Support 大公信用信息服务有限公司 DAGONG GREDIT INFORMATION SERVICES CO.,LTD

数据支持 Data Support BMI Research A FitchGroup Company

前　言

当前，世界多极化、经济全球化、信息社会化、文化多样化深入发展，各国间的政治、经济、文化联系日益密切，同时人类发展和进步面临诸多挑战。2013 年中国提出“ 共建丝绸之路经济带和 21 世纪海上丝绸之路（简称‘一带一路’）”倡议，迅速得到国际社会的广泛关注和高度评价，全球 100 多个国家和国际组织积极支持并参与到“ 一带一路 ”建设中。

4 年来，作为“ 一带一路 ”合作优先发展的领域，基础设施的互联互通不断加强，大批交通、能源、公用事业等领域合作项目加速提上日程。2017 年 5 月 14 日，在北京举办的“ 一带一路 ”国际合作高峰论坛上，各国政要达成系列共识，强调进一步推动设施联通方面的务实合作，支持新亚欧大陆桥、北方海航道、中间走廊等多模式综合走廊和国际骨干通道建设，逐步构建国际性基础设施网络。全球基建领域投资者、建设者及各相关方将迎来巨大的市场机会。

然而，由于“ 一带一路 ”沿线国家基础设施发展水平不一，政治经济背景差异较大，参与企业面临诸多挑战和不确定因素，需要加大研究力度，积极稳妥地推进各项投资和建设项目。

鉴于上述，为深入研究国际基础设施发展状况、特点和趋势，发现投资机遇，应对潜在挑战，给国内外跨国基建领域的投资者、建设者及各相关方开拓国际市场提供参考，助力全球基础设施发展，中国对外承包工程商会携手大公国际信用评级集团共同开展了“ ‘一带一路’国家基础设施发展指数 ”研究。该指数研究将作为重要成果每年在澳门“ 国际基础设施投资与建设高峰论坛 ”上发布，并搭建基础设施发展信息服务平台，长期提供指数分析和动态数据资料。

该指数研究前后历时近一年，采集跨度为十年的数据上万条，开展专家、企业研讨会议数十次，吸收了来自政府有关部门、国家权威研究机构以及骨干会员企业的 30 余名专家的意见。研究团队开创性地构建了“ 国家基础设施发展指数 ”模型，立足于影响一国基础设施发展的三大因素，从环境、潜力、趋势的维度评判未来 2-3 年该国基础设施发展前景。2017 年指数将来自“ 一带一路 ”沿线和葡语共同体的 71 个国家共同作为研究对象，随着越来越多的国家积极响应与参与“ 一带一路 ”倡议，后续指数研究的范围将不断扩大。目前，2017 年指数研究成果和分析报告已经完成，现对外发布，以飨读者。

本报告分为五大部分：第一部分为有关指数的介绍，包括含义、架构、研究范围等；第二部分为总体分析，重点就“ 一带一路 ”国家基础设施发展前景的总体特点进行阐述和分析；第三部分为影响因素分析，即从发展环境、潜力、趋势角度具体分析基建行业发展特点和内在逻辑关系；第四部分为细分行业领域的具体分析；第五部分对当前“ 一带一路 ”国家基础设施发展的机遇和挑战进行总结，并提出相关建议。

望每一位读者，尤其是全球基建行业参与者，在阅读本报告后能够有所收获。由于研究水平有限，时间紧迫，本指数研究和分析报告仍存在诸多疏漏和不足之处，敬请广大读者批评指正，我们将在接下来的研究和报告撰写工作中逐步加以完善。

最后，感谢以下机构对本指数研究和报告撰写所给予的支持和帮助：中国商务部合作司、澳门贸易投资促进局、大公国际信用评级集团、BMI（Business Monitor Research）、国务院发展研究中心、国家发改委国土开发与地区经济研究所、国资委研究中心、商务部国际贸易经济合作研究院、中国社会科学院、对外经济贸易大学、中国出口信用保险公司、国家开发银行、中国进出口银行、中国交通建设股份有限公司、中国建筑股份有限公司、中国技术进出口总公司、中国冶金科工股份有限公司、中地海外集团有限公司、北大纵横管理咨询集团等。同时，对每一位参与本指数研究和报告撰写的个人表示衷心感谢。

中国对外承包工程商会

2017年5月

目 录

第一章 关于指数

为促进“一带一路”倡议的实施，为中国“走出去”企业和全球投资、承建、运营商参与跨国基础设施项目提供决策参考，帮助相关方把握趋势、发现机遇、规避风险，中国对外承包工程商会（简称“承包商会”）与大公国际信用评级集团（简称“大公国际”）携手开发了“‘一带一路’国家基础设施发展指数”（The Belt and Road Infrastructure Development Index，简称“发展指数”、“本指数”或BRIDI）。

在对已有其它指数模型和国际基础设施发展因素进行反复研究的基础上，研究团队明确了发展指数的研究范畴，构建了指数研究模型。

一、发展指数的含义和范围

通常来讲，“基础设施”是指对产出水平或生产效率有直接或间接提高作用的经济项目[1]。参考世界银行和国际商业观察（Business Monitor International，BMI）对基础设施的分类，本指数研究将基础设施划分为交通、能源、公用事业、建筑四大领域。其中，交通业包括公路、铁路、机场、港口等项目；能源业主要研究石油天然气与电力行业；公用事业涵盖水利工程与通信网络；建筑业包括民用建筑与工商业建筑。

本指数研究着眼于目标国基础设施的“发展”，此“发展”不是对该国基础设施现状的描述，而是对其发展前景的评价。因此，发展指数是基于对一国基础设施发展的几大影响因素的分析，显示对该国未来2–3年基础设施发展前景的判断的指数。国家发展指数是本指数研究的基础和主体，此外，研究团队还对“一带一路”国家基建发展总指数和一些分项指数进行了测算和分析。

本指数中的“一带一路”国家涵盖了除中国以外的其他的63[2]个国家。另外，葡语国家与“一带一路”沿线国家在基础设施建设的资源、技术和市场等方面具有很强的互补性，双方在交通运输、电力、石油化工等领域的合作已经取得了初步进展，未来合作空间巨大。为配合在澳门召开的“国际基础设施投资与建设高峰论坛”，发挥其葡语国家商贸合作服务平台的作用，将8个葡语共同体国家加入研究对象。因此，本指数2017年的研究共选定71个国家和地区（以下简称“‘一带一路’国家”）作为研究对象。随着越来越多的国家积极响应与参与“一带一路”倡议，后续指数研究的国家范围将不断扩大。

本指数（2017年）研究范围

“一带一路”沿线共63国	蒙古、新加坡、马来西亚、印度尼西亚、缅甸、泰国、老挝、柬埔寨、越南、文莱、菲律宾、伊朗、伊拉克、土耳其、约旦、黎巴嫩、以色列、沙特阿拉伯、也门、阿曼、阿联酋、卡塔尔、科威特、巴林、希腊、塞浦路斯、埃及、哈萨克斯坦、乌兹别克斯坦、土库曼斯坦、塔吉克斯坦、吉尔吉斯斯坦、印度、巴基斯坦、孟加拉、阿富汗、斯里兰卡、马尔代夫、尼泊尔、不丹、波兰、立陶宛、爱沙尼亚、拉脱维亚、捷克、斯洛伐克、匈牙利、斯洛文尼亚、克罗地亚、波黑、黑山、塞尔维亚、阿尔巴尼亚、罗马尼亚、保加利亚、马其顿、俄罗斯、乌克兰、白俄罗斯、格鲁吉亚、阿塞拜疆、亚美尼亚、摩尔多瓦
葡语国家共同体8国	葡萄牙、巴西、安哥拉、莫桑比克、几内亚比绍、佛得角、东蒂汶、圣多美和普林西比

二、发展指数的模型

影响基础设施发展前景的既有基础设施行业外部的因素，也有基础设施行业本身发展动力和趋势的因素。经过对各因素的梳理、对比和分析，本指数从基础设施发展环境、发展潜力、发展趋势三个维度构建“国家基础设施发展指数”分析模型并测算了上述3个子指数，同时3个子指数下设8个二级指标和33个三级指标。

1. 发展环境是跨国基础设施建设的首要影响因素，是实际开展跨国基础设施投资或建设的主要风险。

发展环境指数下设政治环境、社会环境、金融环境、营商环境4个二级指标。**政治环境**考察影响基础设施建设的政治因素，包括政局稳定性、基础设施发展战略清晰度、政策连续性、国际关系友好度、基建行业开放度等指标。**社会环境**考察治安、文化等社会因素能否保障基础设施项目顺利进行。**金融环境**考察跨国基建项目资金运转的可持续性及资金回收难易程度，包括汇率、物价、资本项目开放度、国家债务安全度等指标。**营商环境**考察跨国基建投资企业经营效率的影响因素，包括经济法律完善度、行政效率、商业便利度、税收负担等指标。

2. 发展潜力用来衡量一国基础设施发展的长期驱动力

发展潜力指数下设市场需求和生产要素资源2个二级指标。**市场需求**考察国内人均基础设施保有量、经济发展水平和国际交往状况对基础设施发展的需要。**生产要素资源**考察跨国基建项目中土地、原材料、人力、资金等要素资源的供给情况。

3. 发展趋势反映了基础设施建设的动态，预示基础设施行业短期内发展走向。

发展趋势指数下设基础设施增长速度与跨国基建项目热度2个二级指标。**基础设施增长速度**考察各国基础设施细分行业增长情况，考察指标包括基础设施各行业年产值和行业投资形成额增长率；**跨国基建项目热度**考察各国基建市场受跨国工程承包商青睐程度，具体考察跨国基础设施建设项目新签合同状况。

国家基础设施发展指数以前一年上述各指标的数据和信息为依据，依指数模型测算得出，每年发布一次。鉴于2017年为首次研究，为准确把握基础设施发展趋势和脉络，研究团队集中收集了2006年至2016年的数据和信息，并选取各指标在2007年的平均值作为基准值，然后通过模型计算得出2008年至2017年71国基础设施发展指数矩阵。在各国年度发展指数的基础上，进一步测算了年度“一带一路”国家基础设施发展总指数。

三、发展指数的特点

基于指数编制思路和测算结果，本指数具有如下特点：

1. 纵向与横向比较相结合，综合评估“一带一路”国家基础设施发展状况。通过对近十年发展指数的纵向比较，可总结出“一带一路”国家基础设施建设的总体发展趋势；通过对各国指数的横向比较，可明确具体国家和地区基建发展在“一带一路”国家中的排位。

2. 内因与外因相结合，多层次研究“一带一路”国家基础设施发展影响因素。通过对发展环境、发展潜力、发展趋势三个维度的分析，综合衡量各国影响基建发展的内部与外部驱动力和风险，深入挖掘各国发展机遇与制约发展的原因。

3. 现状与趋势分析相结合，前瞻性揭示“一带一路”国家基建发展机遇与风险。通过对表现各国基建发展现状、动因、增速等当前数据的考察，揭示基础设施发展的前景，帮助跨国基建各参与方制定战略规划和策略。

1《经济百科全书》1982年版，McGraw-Hill book Company.

2“一带一路”沿线国家中，巴勒斯坦和叙利亚由于数据缺失严重而未作为指数研究对象。

第二章“一带一路”国家基础设施发展总体特点

对2017年指数及过去九年指数结果的分析表明，“一带一路”国家基础设施发展具有如下特点：

一、基础设施发展总体呈现波动上升态势

通过对研究范围内所有国家自身发展指数进行加权平均，得出“一带一路”国家基础设施发展总指数。总指数的年度分布和趋势线显示：“一带一路”国家基础设施发展呈现波动上升的趋势，未来将继续保持稳中有升的态势。

历史指数值还显示，基础设施建设体现了逆周期特点。2009 年和 2015 年受到全球金融危机和新兴市场国家经济下滑的影响，各国基础设施发展跌入低谷。面由于政府纷纷加大基建投入来拉动经济复苏，2010 年和 2016 年的基础设施发展指数创出新高，分别达到 119 和 136。2017 年，各国经济普遍企稳，发展指数回落至 117，但在当前经济周期中，各国会保持对基础设施的投入，基建发展会延续稳步发展的势头。2017 年 5 月在北京举办的“一带一路”国际合作高峰论坛形成了 270 多项具体成果，签署了一批对接合作计划，提出建设复合型的基础设施网络和“一带一路”金融合作网络的计划。这为新时期的经济全球化注入了新能量，国际基础设施发展将迎来新的机遇。

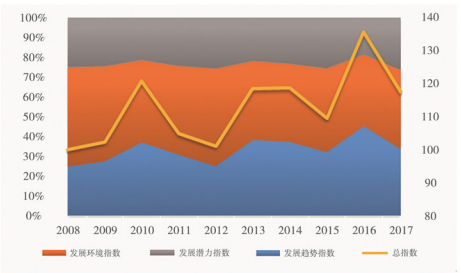


图2.1“一带一路”国家基础设施发展总指数（2008–2017）[3]

3 本图主要用于解释各年间子指数的变化情况（左侧）和总指数发展趋势（右侧）。

二、东盟和中东欧地区发展势头强劲

指数研究显示，“一带一路”国家间基础设施发展前景差异明显。2017 年发展指数排名前十的国家分别是印度尼西亚、伊朗、印度、巴西、越南、新加坡、俄罗斯、葡萄牙、巴基斯坦和保加利亚。其中印度尼西亚以 195 分领跑指数榜，其显著特点是发展趋势指数明显高于他国，且近几年来的指数一直位于高分区间。新加坡排名第六，作为发达国家，新加坡的发展环境指数得分位列第一且发展态势平稳。从指数曲线可以发现巴基斯坦的基础设施发展指数逐年上升。此外，伊朗、沙特阿拉伯等国均排名靠前，是值得基建参与者关注的国家。

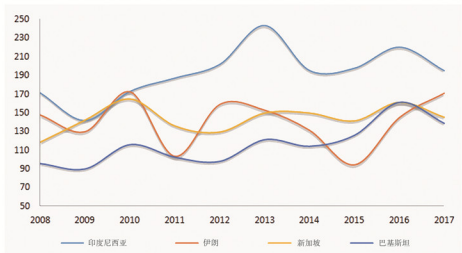


图2.2部分国家基础设施发展指数（2008–2017）

从地区角度看，指数得分较高的国家集中在东盟和中东欧两个地区。2017 年，东盟十国平均指数为 152.2，中东欧地区国家平均指数为 128.3，均明显高出 71 国的整体平均水平（117.4）。

然而，上述两个地区的情况也不尽相同。东盟国家多数为发展中国家，是目前世界人口第三大地区（仅次于中国、印度）、第五大经济体（仅次于欧盟、美国、中国、日本），基础设施存量已无法满足日益强劲的经济增长需求，各国在能源、交通、公用事业、建筑领域存在巨大缺口。发展需求的高分值使东盟国家的指数普遍处于高位。中东欧国家的基础设施发展水平对于欧洲邻国来说相对落后，对基础设施升级需求迫切，而与基建相关的社会、政治、营商等环境在“一带一路”国家中表现相对稳定，促成了中东欧国家在发展指数上的良好表现。

表2.1 2017年TOP20国家指数排名

排名	国家	2017指数	排名	国家	2017指数
1	印度尼西亚	195	11	马来西亚	135

排名	国家	2017指数	排名	国家	2017指数
2	伊朗	171	12	以色列	133
3	印度	170	13	沙特阿拉伯	129
4	巴西	168	14	科威特	127
5	越南	146	15	阿联酋	126
6	新加坡	145	16	卡塔尔	125
7	俄罗斯	144	17	斯里兰卡	124
8	葡萄牙	144	18	菲律宾	124
9	巴基斯坦	139	19	捷克	123
10	保加利亚	136	20	匈牙利	123

表2.2 2017年东盟和中东欧地区国家指数排名

东盟十国	2017指数	发展环境	发展潜力	发展趋势
印度尼西亚	195	32	10	1
越南	146	41	7	5
新加坡	145	1	67	25
马来西亚	135	18	8	14
菲律宾	124	54	16	11
泰国	120	19	6	38
柬埔寨	120	45	21	18
老挝	117	62	28	13
缅甸	113	50	2	35
文莱	109	20	59	49
中东欧国家	**2017指数**	**发展环境**	**发展潜力**	**发展趋势**
保加利亚	136	9	54	9
捷克	123	15	27	24
匈牙利	123	12	52	20
塞尔维亚	119	29	39	21
罗马尼亚	118	27	29	28

中东欧国家	2017指数	发展环境	发展潜力	发展趋势
波兰	117	7	36	63
克罗地亚	115	8	56	58
斯洛伐克	111	25	47	42
黑山	109	28	42	52
拉脱维亚	108	30	51	47
马其顿	107	36	45	48
立陶宛	107	35	44	60
斯洛文尼亚	106	14	62	69
波黑	106	24	53	68
阿尔巴尼亚	104	39	40	64
爱沙尼亚	101	33	61	70
色阶分布从绿色到红色，颜色越红排名越低。				

葡语国家指数整体向好，多数国家发展环境较为稳定，近年来对基础设施需求增大，安哥拉、巴西、东帝汶等国基建产业上升明显，巴西在葡基建产业发展最为迅速，安哥拉则广泛受到国际基建参与者的关注，基建热度较高。

图2.3 “一带一路”国家基础设施发展指数热力分布图（2017）

三、交通和电力行业成为国际基础设施发展的重要引擎

推动“一带一路”国家基础设施建设，交通业是支撑，也是构建全方位、多层次、复合型的互联互通网络的优先领域和突破口；电力基础设施是其他基础设施发挥功能的前提条件，对国民经济的发展具有全局性的影响。从 2017 年指数分析指标来看，交通和电力基础设施发展速度高于基础设施总体发展速度（参见图 2.4），成为拉动基础设施发展的主要力量。鉴于此，许多“一带一路”国家把交通业和电力基础设施作为基础设施发展规划的重点领域。预计交通业和电力基础设施未来仍将保持快速增长，继续引领各国基础设施发展。

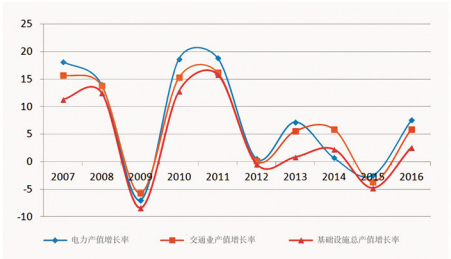


图2.4“一带一路”国家交通业、电力与基础设施总产值增长率

数据来源：BMI，研究团队整理

四、各国基础设施市场需求呈现扩张趋势

由于生产资源在中短期内基本保持稳定，市场需求成为发展潜力指数的主导因素。十年来，“一带一路”国家发展潜力持续增长（参见图 2.5），2008 年金融危机后，“一带一路”国家国际投资、进出口贸易、跨境旅游等国际经济往来更加频繁，有效带动了经济增长，提升了对基础设施建设的需求。2017 年发展潜力指数得分较 2016 年明显上升，达到 135，其中市场需求指标得分 104，贡献度约为 77%。整体而言，未来“一带一路”国家基础设施发展潜力巨大且将保持上升态势。

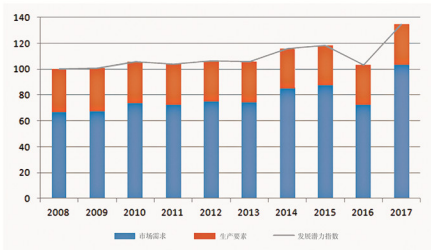


图2.5“一带一路”国家发展潜力指数趋势

五、跨国基建热度显著升高

基建产值增速和跨国基建热度显示了一国基础设施发展的短期趋势。指数结果显示，近两年跨国基建参与者对“一带一路”国家基建参与热情显著提高。主要表现为跨国基建新签合同数量和合同额突增，其中 2015 年新签合同额比 2014 年增加 150%，2016 年新签合同规模虽然比 2015 年有所下降，但仍处于高位。综合对比近两年“一带一路”各国的基础设施项目数据，东盟和南亚地区部分国家基础设施发展趋势良好，表现突出的国家有越南、印度尼西亚、巴基斯坦、印度等国。

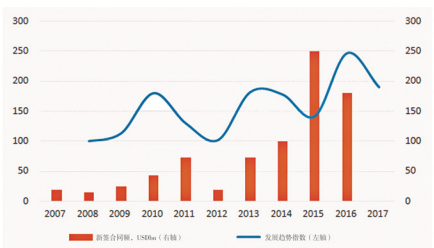


图2.6“一带一路”国家发展趋势指数及跨国基础设施项目新签合同额

六、政治环境和金融环境的波动对基础设施发展造成不利影响

发展环境主要考察政治、社会、金融和营商环境四个方面。而政治环境和金融环境对于一国基础设施发展尤为重要。过去几年中，“一带一路”国家社会、营商环境相对平稳，但政治和金融环境波动明显。指数分析显示：2015 年政治环境指标有所下降，金融环境指标波动明显，导致发展环境指数有下降趋势（参见图 2.7）。

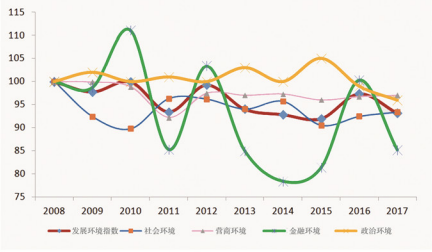


图2.7 “一带一路”国家发展环境指数趋势

2015 年以来，部分国家之间关系的恶化，地缘政治日渐复杂，贸易保护主义有所抬头，逆全球化思潮涌现，宗教冲突、民族矛盾凸显，致使政治环境指标有所恶化。与此同时，“一带一路”部分国家汇率波动明显，财政赤字日渐严重，主权债务偿债风险增加，导致金融环境波动加剧，制约了基建发展环境的改善。虽然随着打击国际犯罪力度加大，边境管控力度增强，行政效率、商业效率的提高，基础设施发展的社会环境和营商环境有所改善，但是综合来看，政治环境和金融环境的低位态势短期内难以改变，将不利于基础设施投融资，并在一定程度上对“一带一路”基建项目的持续发展产生不利影响。

第三章 “一带一路”国家基础设施发展影响因素分析

从影响因素来看，发展环境是一国基础设施发展的背景和基础，发展潜力是基础设施发展的动力和保障，而发展趋势是基础设施发展的“晴雨表”。为了更深入地考察“一带一路”国家基础设施发展，从三个子指数的角度分析如下：

一、各国发展环境差异较大，社会环境与营商环境逐渐改善，部分国家贸易保护主义抬头，基建行业壁垒较高。

历史指数结果显示，各国发展环境指数差异明显，虽然这一差距由于部分国家社会环境和营商环境的逐步改善而逐渐缩小，但是由于受到政治环境和金融环境的影响，发展环境指数总体有所下降。

表3.1 “一带一路”国家2017年发展环境指数TOP10

排名	国家	2017指数
1	新加坡	166
2	葡萄牙	133
3	俄罗斯	126
4	巴西	120
5	科威特	119
6	以色列	115
7	波兰	115
8	克罗地亚	113
9	保加利亚	113
10	塞浦路斯	113

1. “一带一路”政治环境整体平稳，部分国家政局欠稳定，基建行业准入门槛较高。

政治环境对基础设施投资和建设的影响极大。总体而言，“一带一路”国家保持政局稳定，但是部分国家受到政府更迭、民族教派冲突和战乱的影响，政治环境指标有所下降。2017 年政治环境排名前十的国家主要分布在中东欧地区；泰国政局不稳，2017 年举行的选举将进一步增加政局风险；南亚国家由于民族矛盾问题，政局稳定性受到影响；乌克兰、叙利亚和阿富汗等国家由于战乱和地缘政治裹挟，政局稳定性和政策连续性表现较差。

虽然多数国家制定了详细的国家发展和基础设施发展规划，但在基建行业开放度方面，行业壁垒问题依然突出。部分国家基础设施行业本土保护意识较强，在投资规模、资金来源、投资方式等方面有明显限制，提高了国际投资者进入的门槛。

表3.2部分国家基建行业准入制度

国家	准入制度
蒙古	1.蒙古国不允许外国自然人在当地承揽工程承包项目。 2.外国国有资产法人在矿业、金融、通讯领域开展经营活动且其持股比例达到33%或以上的，须报主管投资事务的中央行政机关(即外国投资局)进行审批。
菲律宾	对外资试行“资质许可管理模式”，水电通讯和运输等基础设施工程的承包商需要获得公共事业许可证，且菲方持股比例不低于60%，同时，外方不得承揽由菲本地资金投资的建筑工程项目。
乌克兰	在建筑领域实行准入制度。外国设计与施工单位在乌克兰承包工程项目，必须首先在乌克兰注册企业，并向乌克兰地区发展、建设和住房公共事业部下设的专门委员会提交有关设计与施工资质材料，待其审核颁发设计与施工资质许可。上述材料的组织和提交手续均比较复杂，且周期较长(大约在半年至1年左右)。
以色列	政府投资在500万特别提款权及以上的公共工程项目，只对《政府采购协议》成员开放，非成员国家的企业禁止参与。
老挝	1.对国产水泥、钢筋、洗沽净、PVC管、镀锌瓦、水泥瓦实行保护 2.根据外国投资的项目、产业、规模、特性，土地租期最高不得超过50年，但可按政府的决定视情形续租
马来西亚	1.马来西亚法律规定，外国独资企业不能获得A级建筑承包执照，而没有A级执照不能作为总承包商参与政府1000万马币以上项目招标； 2.不允许外国工程公司单独担任总承包商，外国公司只能从当地公司中分包工程

资料来源：研究团队根据商务部《对外投资合作国别（地区）指南》整理

2. 南亚地区社会环境有待改善， 东盟地区社会环境明显提升， 部分国家出入境便利度有待提高。

社会环境与跨国基建活动息息相关，尤其是社会治安、文化融合、医疗卫生等方面。从区域来看，中东欧地区国家社会环境指标表现较好，其平均值（107）高于总体平均水平（90）；东盟国家整体社会环境指标有所提升，近年来加强执法合作，携手反恐和打击跨国犯罪，犯罪率呈著下降；在南亚地区，民族和种族众多，文化的多样性强，随着区域合作组织和自由贸易协定的签订，国家间贸易和投资壁垒有所下降，但是由文化、宗教、种族差异引起的贸易保护、违约和冲突仍时有发生。

值得注意的是，部分“一带一路”国家的“人员出入境便利度”较低，对外国人员获得劳务或工作签证设置了较繁琐的手续或较高条件，为跨国基建参与者带来制度障碍。例如，印度对其他国家公民在印境内务工控制较严，一般管理人员和工程技术人员难以获得工作签证，普通工人更是极难获得相关工作签证；有些国家的工作人员在办理出入境手续过程中强制收取小费，降低了国家之间出入境便利度，不利于跨国基础设施项目建设。

3. 金融危机后总体金融环境波动明显， 偿债风险有所上升。

历史指标显示，金融危机后各国金融环境有所改善，但整体波动较大。各个地区金融环境在2009 年陡然变差，2012、2016 年金融环境指标有所回升，而 2017 年指标由于国家主权偿债风险的提升有下降趋势。

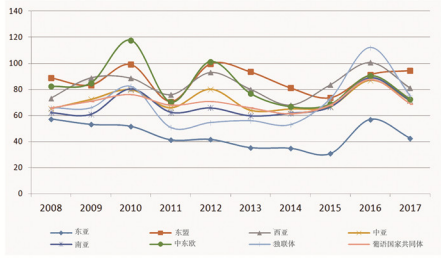


图3.1区域金融环境指标[4]

数据来源：研究团队整理

在金融危机中，由于 2008 年“一带一路”国家物价指数（CPI）明显上涨，2009 年各国汇率平均波动性提高，外加各国财政赤字水平显著上升，国家偿债风险突出，致使基建发展的金融环境急速转差。2012 年以后，各国 CPI 显著回落，外商直接投资比例明显提高，金融环境趋好。但是 2016 年各国汇率平均波动率大幅上升（参见图3.2），摩尔多瓦等国货币汇率波动超过 30%，俄罗斯卢布大幅贬值近 60%；各国财政支出维持高位，财政赤字规模持续扩大，创历史高点，国家主权偿债风险显著增加，2017 年金融环境指标有所回落。

值得注意的是，受欧债危机的影响，中东欧地区部分国家金融环境转差，但近年来在欧盟的支持下，金融环境逐渐好转。

近年来，葡萄牙在金融危机和欧债危机的叠加影响之下，向欧盟委员会、欧洲央行和国际货币基金组织请求援助，同时采取严格措施削减财政赤字并实施结构性改革措施，金融环境逐渐得到改善。

4 其中东亚地区仅包括蒙古。

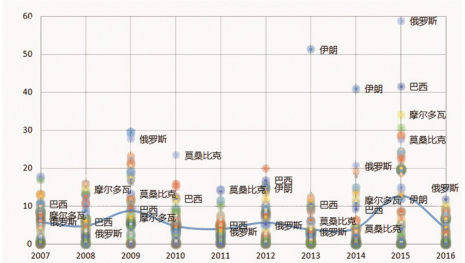


图 3.2 “ 一带一路 ” 国家汇率波动分布

数据来源：世界银行，研究团队整理

4. 总体营商环境不断改善， 各国在商业便利度、行政效率和税收负担等方面各有优势。

营商环境的优劣直接影响到基础设施建设能否顺利开展。测算结果显示，2017 年营商环境指标较 2016 年有所上涨，主要原因在于随着 “ 一带一路 ” 国家经济法律不断完善，行政效率逐渐提高，支付结算更加便利，营商环境逐渐得到改善。“ 一带一路 ” 国家缴税所需时间、履行合同所需时间，注册公司所需时间和税收成本均有所降低（参见图 3.3）。

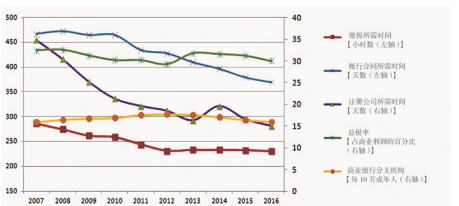


图 3.3“ 一带一路 ” 国家营商环境部分指标平均值表现情况展示

数据来源：BMI，研究团队整理

在行政效率方面，东盟、葡语国家表现较好，如新加坡和葡萄牙在缴税所需时间、注册公司所需时间两个指标上处于较优水平；在商业便利度方面，俄罗斯、哈萨克斯坦在履行合同所需时间上表现较好；在物流绩效方面，新加坡以优越的地理位置和优秀的物流管理经验，物流绩效居于领先水平；在税收负担方面，沙特阿拉伯和新加坡企业税负占商业利润比重较低。

	俄罗斯	葡萄牙	新加坡	保加利亚	巴基斯坦	沙特阿拉伯	哈萨克斯坦
缴纳所需时间（小时数）	168	275	83	424	594	54	188
注册公司所需时间（天数）	11	2	2	18	19	20	10
履行合同所需时间（天数）	307	547	150	564	993	575	370
总税率（占商业利润的百分比）	47	41	18	27	33	15	29
商业银行分支机构（每 10 万成年人）	33	51	9	60	10	9	3
物流绩效	2.57	3.41	4.14	2.81	2.92	3.16	2.75

色阶颜色分布从绿色到红色依次变化，单元格颜色越绿代表该国家在所在指标表现越好，营商环境越好；单元格颜色越红，代表该国家在所在指标表现越差，营商环境越差。

图 3.4 部分国家营商环境数据

数据来源：世界银行、BMI，研究团队整理

二、发展潜力强劲，产业经济发展需求与城市化进程仍是根本驱动力量，国际交往加深对基础设施发展提出更高需求。

“ 一带一路 ” 国家发展潜力指数整体平稳上升，东盟、葡语国家市场需求最为强劲，中亚、西亚需求偏弱。从资源要素看，“ 一带一路 ” 国家以其充足的生产要素资源和人力资源对国内外投资者和建设者具有较强的吸引力。

表 3.3 “ 一带一路 ” 国家发展潜力指数 TOP10

排名	国家	2017指数
1	阿联酋	86
2	缅甸	76
3	印度	74
4	尼泊尔	73

排名	国家	2017指数
5	俄罗斯	72
6	越南	72
7	马来西亚	71
8	巴西	71
9	印度尼西亚	70
10	乌克兰	69

1. “一带一路” 国家基础设施需求旺盛

总体看来，大部分“一带一路”国家为发展中国家，经济增长快，国际经济活动日益频繁，但基础设施普遍比较落后，人均保有量低，各国对基础设施的改进和升级具有强烈的需求。东盟、南亚地区部分国家正在吸引国际制造业的转移，随之而来的是产业升级和城市化进程加快，电力、交通等行业基础设施的供给产生巨大缺口。过去十年间，“一带一路”国家间的投资、贸易、旅游等跨国经济活动日益活跃也对基础设施发展提出新需求。

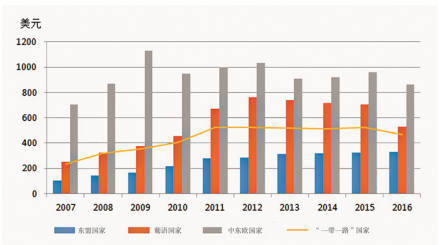


图 3.5 区域人均基础设施产值

数据来源：世界银行、BMI，研究团队整理

2. 多数 “一带一路” 国家基建资源优越， 人力资源充足。

生产要素资源作为影响供给的重要因素，直接影响基础设施的建设成本。从生产要素资源来看，“一带一路”国家钢材、水泥等建材供应充足，其中，越南是世界第五大水泥生产国，印度是第四大钢铁生产国，能够满足国内建筑物资需求。充足的人力资源和较低的劳动力价格也是基础设施快速发展的必要条件，2015 年印度尼西亚平均工资 282 美元 / 月，柬埔寨的平均工资为 207 美元 / 月，远低于全球平均水平 1480 美元 / 月[5]。巴西作为 “ 金砖四国 ” 之一，经济规模、资源和市场容量较大，人力资源丰富，未来发展空间广阔。

3. “一带一路” 国家不同地区间发展潜力差异明显

“ 一带一路 ” 国家对于基础设施建设的需求不同，加之生产要素资源水平呈现明显差异，不同地区间发展潜力差别很大（参见图 3.6）。2017 年的发展潜力指数显示，越南、印度尼西亚、印度、马来西亚等部分东盟、南亚国家经济增长快，同时具有基础设施建设要素优势，发展潜力强劲，发展空间巨大。相比之下，西亚、中亚部分国家，经济发展较慢，生产要素资源匮乏，制约其基础设施的发展。

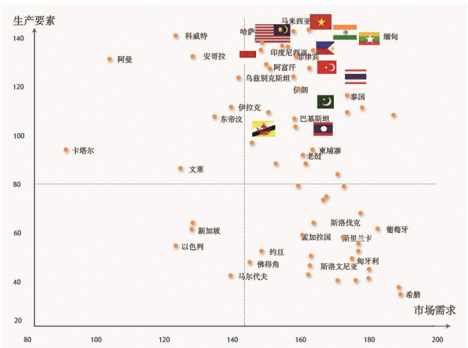


图 3.6“ 一带一路 ” 国家市场需求和生产要素分布图

5. 国际劳工组织(ILO)2014–2015全球工资报告www.ilo.org

三、发展趋势呈现波动上升态势，印度尼西亚、印度、越南、伊朗兼具发展速度与跨国基建项目热度。

总体来看，“ 一带一路 ” 国家基础设施呈现波动增长，近两年跨国基建项目热度较高，预示 “ 一带一路 ” 国家基础设施发展整体呈现良好态势。印度尼西亚等四国基建增速较快，巴基斯坦等国跨国基建热度较高，未来或成新增长点。

1. 基础设施行业总产值波动增长，近两年跨国基建项目新签合同额明显增加。

图 3.7 “ 一带一路 ” 国家基础设施行业总产值及跨国基建项目新签合同额

数据来源：BMI，研究团队整理

“ 一带一路 ” 国家基础设施行业产值总体呈上升趋势，但近两年略有回落。主要是受石油等资源类大宗商品价格处于低位的影响，部分资源出口型国家财力无法为基础设施发展规模持续扩张提供支持，致使其基础设施产值下降幅度较大。如俄罗斯 2015 年基础设施产值比 2014 年下降约 27%。东盟等地区国家基础设施则仍然维持较快发展，在 2016 年基础设施产值规模排名靠前的国家中，印度尼西亚的基础设施产值增长幅度最大，增长率达 10.4%。

2015 年起跨国基建公司对 “ 一带一路 ” 国家基建项目参与热情显著提高，表现为当年跨国基建新签合同数量和合同额明显增加，其中新签合同额比2014年增加将近1.5倍，以伊朗、塞尔维亚、埃及、以色列等国家最为突出。虽然与 2015 年比，2016 年新签合同规模有所下降，但仍处于高位。

2. 巴基斯坦、斯里兰卡、保加利亚、亚美尼亚等国跨国基建明显升温。

一国基础设施产值的年度增长率代表着基础设施发展速度和惯性，该国年度跨国基建项目的签约额则代表着跨国基础设施发展热度。从这两个指标的表现上看，不同国家的基础设施发展趋势存在较大的差异 (参见图 3.8)。

印度尼西亚、印度、越南、伊朗等国的发展速度和基建项目热度均处于较高水平，表明其基础设施建设正处于上升阶段，跨国基建公司对其投资环境、发展潜力比较认可，投资意愿较高，未来仍将延续较快发展态势。巴基斯坦、斯里兰卡、保加利亚、亚美尼亚等国发展速度低但基建项目热度较高，表明这些国家基础设施建设处于起步阶段，基础设施扩张需求较大，可作为跨国基建公司的重点关注对象。

巴西基础设施发展速度处于较高水平，但是由于近年来金融环境转差，跨国基建项目热度处于较低水平。葡萄牙、安哥拉等葡语国家基础设施发展速度和跨国基建项目热度均处于中等水平，基础设施建设稳步进行。

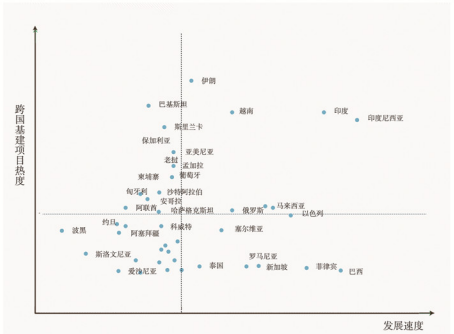


图 3.8 “ 一带一路 ” 国家基础设施发展趋势分布图

数据来源：BMI，研究团队整理

第四章“一带一路”国家基础设施行业分析

从指数结果来看，“一带一路”国家基础设施发展稳中有升，但不同行业的发展情况存在一定差异。交通行业发展趋势较好，建设需求明显，中长期规划清晰而明确，未来有望持续增长；建筑行业产值较高，发展平稳，住房建筑发展空间大；电力是能源行业发展重点，可再生能源和核能等新能源逐渐受到关注；公用事业产值占比较低，电信领域的跨国投资前景较好。

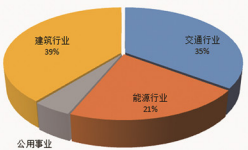


图4.1 “一带一路”国家基础设施行业产值占比

数据来源：BMI，研究团队整理

一、交通建设需求明显，未来有望持续增长

近十年来，“一带一路”国家交通项目建设呈增长态势（参见图 4.2）。2007–2016 年，交通项目总产值增长了 64.5%。但 2016 年“一带一路”国家交通建设人均产值仅 61 美元，仍处于较低水平，与全球人均产值 97.3 美元相比仍有较大差距。

多数“一带一路”国家将交通基础设施建设作为塑造经济空间格局的重要途径，在中长期规划中着重强调交通业的发展。“一带一路”国家交通业基础设施发展规划主要集中于公路铁路的升级改造、高速公路网及铁路网的构建方面，巴西、波兰、哈萨克斯坦、印度尼西亚和印度比较典型。

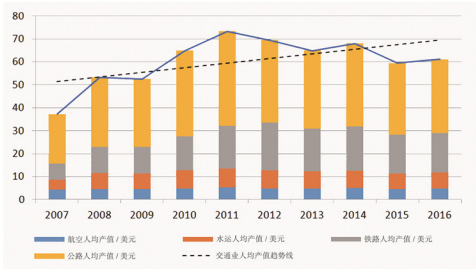


图 4.2“一带一路”国家交通业人均产值

数据来源：世界银行、BMI，研究团队整理

表 4.1 部分国家交通业发展规划

国家	类型	发展规划
巴西	公路	新建公路7919公里，维修公路5.5万公里；投资总额661亿亚雷尔。
	铁路	新建铁路4696公里，研究3条高铁可行性；投资总额864亿亚雷尔。
	水运	港口开发、私人码头改造等，投资总额374亿亚雷尔。
	空运	福塔莱萨、萨尔瓦多等机场，投资总额30亿亚雷尔。
波兰	公路	2020年前，建成7200公里的高速公路和快速公路网络。
	铁路	1. 2020年前，在12个大城市之间建成时速160公里的铁路线； 2. 完成华沙中央站、格丁尼亚、弗洛茨瓦夫等火车站的现代化改造以及华沙西站、华沙东站、卡托维兹站的建设。
	空运	新建航站楼和进行停机坪改造，并对跑道和滑行道进行现代化改造等。

国家	类型	发展规划
哈萨克斯坦	公路	2020年前完成连通国内各地区公路干线项目，完成1.6万公里国际级公路。
	铁路	1. 2020年前，新建1400公里新铁路； 2. 将老化铁路、陈旧的车辆和设备的占比降低到40%；货车中转运输的速度不低于55公里/时。
印度尼西亚	公路	2015–2019年内，建设2650公里长的公路和1000公里的高速公路，维修全长46770公里的现有公路。
	铁路	2015–2019年内，新建3258公里的铁路网。
	水运	2015–2019年内将兴建24个大型港口项目。
	空运	在2019年之前新建15个机场。
印度	公路	增加投资1万亿美元在公路建设领域，并对国道、邦道实施升级改造。
	铁路	1 到2020年，将列车现行130公里/时的平均时速提升至160–200公里/小时； 2 对全国22个主要火车站进行现代化改造； 3 到2020年新增铁路25000公里。
	空运	1 新建新孟买机场和果阿机场； 2 在二、三线城市新建机场8个，完成21个机场的升级改造。

资料来源：研究团队根据商务部《对外投资合作国别（地区）指南》整理

二、住房建筑发展空间大，改善型住房是热点

近年来“一带一路”国家建筑行业基本保持平稳发展，行业总产值呈上升趋势，近两年稍有回落。综合来看，未来几年“一带一路”国家工业类建筑和保障性住宅建设需求较大。

部分国家建筑公司资质不够、融资困难，在保障性公共住房领域对外部资金和技术需求较大，且政策上对建筑业相对开放，可以重点关注。

表 4.2 部分国家建筑行业发展规划

国家	类型	发展规划
俄罗斯	建筑	1.2017年前在36个地区建成2500万平方米的住宅； 2.投入约8678亿卢布开发和完善圣彼得堡的住宅建筑； 3.在2019年年底前，拟提供7.44万亿卢布资金用于国内住房建设融资。
哈萨克斯坦	建筑	1.2020年将建成800多万平米的经济适用房； 2.拟大力发展非住宅领域的基础设施建设，来缓解经济疲软局面。
印度尼西亚	建筑	1.2015–2019年计划建设5257个双顶公寓大厦； 2.拟开发建设13个工业园区。
缅甸	建筑	1.在2013到2028年期间，建设100万套民用公寓；
沙特阿拉伯	建筑	1.2025年前，新建房屋300万套。

资料来源：研究团队根据商务部《对外投资合作国别（地区）指南》整理

三、能源业产值稳中有升，电力是未来发展重点

大部分“一带一路”国家能源业发展稳中有升（参见图 4.3），其中印度能源业产值处于较高水平，且将有上升趋势；俄罗斯能源行业发展也处于较高水平，2014 年俄罗斯受到美国和西方国家经济制裁，能源行业发展有所回落，但从 2016 年数据来看，未来行业产值有望保持稳定；其他国家如印度尼西亚、土耳其、卡塔尔等能源行业产值将呈现较为平稳增长趋势。

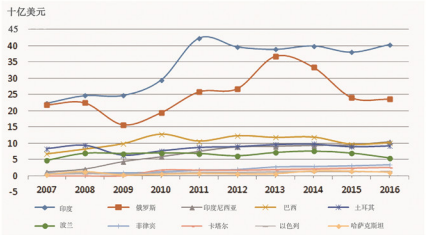


图 4.3 部分国家能源业近十年增长趋势

数据来源：BMI，研究团队整理

“一带一路”国家的能源发展规划中，电力行业的规划占有相当篇幅，并且能源的可持续发展是规划的重点。主要原因在于“一带一路”国家多为发展中国家，电力的短缺将制约国家经济的持续增长，因此，各国对电力基础设施建设尤为重视。数据显示，电力行业增长趋势明显，其产值占比从 2013 年的 67% 上升到 2016 年的 70%(参见图 4.4)。由于石油和天然气受到市场的不利影响而增长乏力，预计电力占比的上升空间还会不断增大。

随着可持续发展理念深入人心，各国开始关注可再生能源和核能的开发，未来核电项目和新能源项目将更受欢迎。

表 4.3 部分国家能源行业发展规划

国家	类型	发展规划
伊朗	电力	1.在2025年以前，计划新建9座核电站； 2.投资500亿美元，在20年内新建800个能源工程。
	可再生能源	1.到2018年新建5000MW的风电和太阳能产能，集中太阳能电力产能至少达500兆瓦； 2.修建第一座50兆瓦的地热电站。
越南	电力	优先发展水电，在2020年提高到21600兆瓦，到2025年提高到24600兆瓦。
沙特阿拉伯	核能	在2030年之前，新建16座核电站，耗资约1000亿美元，总发电量可达22000兆瓦。
巴基斯坦	电力	1. 加快大中型水电站建设，力争在2030年将水电发电量提高到3266万千瓦； 2. 开发1800亿吨的塔尔煤田，发展火电站建设。
	石油天然气	预计可开发储量可由现在的8.4亿桶和515亿立方英尺提高到270亿桶和2820亿立方英尺。
	核能	核电装机目标880万千瓦。
	可再生能源	装机容量970万千瓦。

资料来源：研究团队根据商务部《对外投资合作国别（地区）指南》整理

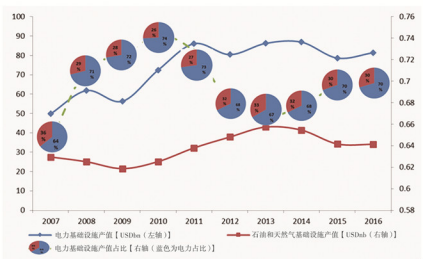


图 4.4“一带一路”国家电力基础设施和石油、天然气基础设施产值对比

数据来源：BMI，研究团队整理

四、公用事业政策开放度逐渐提高，电信领域前景较好

“一带一路”国家公用事业整体发展趋势平稳，从新签项目来看，该领域的跨国合作项目主要集中于污水处理和电信网络。

电信建设一直是限制外商投资的重点领域，投资许可门槛高，申请手续繁杂，如波兰、缅甸、孟加拉、印度、马来西亚等国，严格限制外资参与电信服务。柬埔寨从 2012 年开始停止发放电信营运执照；俄罗斯、印度尼西亚、埃塞俄比亚等国家拒绝开放国内电信市场，电讯基站建设、运营和管理等领 100% 由内资控股。随着政策开放度的逐渐提高，大部分“一带一路”国家通过多种措施不断放开电信市场的管制，对电信服务实行私有化，鼓励外资参与电信设施建设。各国计划在通信领域，尤其是网络升级和网速提升等方面继续加大投入（参见表 4.4）。

表 4.4 部分国家公用事业行业发展规划例示

国家	类型	发展规划
哈萨克斯坦	通信	1. 2020年前，建成现代化光纤及无线传导多媒体技术通讯基础设施；将电脑普及率提高至60%。 2. 2020年前，对24400公里网络进行现代化改装。
波兰	通信	2014年–2020年，发展电信基础设施网络，刺激对高流量服务的需求，保证建立覆盖波兰全境的宽带网络。
印度尼西亚	通信	在东区兴建全长1.2万公里的光导纤维网，使其拥有3个终端与其他国家连接。
	供水设施	1. 在城镇建设净水供应系统； 2. 在227个市县区建设污水处理系统，并为430个市县区提供污水处理服务；
马来西亚	通信	1. 到2020年，第二代高速宽频网络接入的区域及家庭，实现100M/s的速度； 2. 在全国郊区和乡村共增设42万个宽频网络接口，到2020年，50%的郊区和乡村享受20M/s的网络接入速度。

资料来源：研究团队根据商务部《对外投资合作国别（地区）指南》整理

第五章 结语

“一带一路”倡议为深化沿线国家经贸合作和促进区域共同发展开辟了崭新路径，目前各国基础设施合作正稳步推进，但仍存在多方面潜在挑战。建议企业把握跨国投资新机遇、规避风险，结合目标国实际情况开展业务，实现企业和地区基础设施发展共赢。

一、机遇

“一带一路”倡议为促进各国基础设施协同发展带来政策红利。在此背景下，巴基斯坦、斯里兰卡等国成为“一带一路”国家新增长极，可持续发展理念在基础设施领域的实践将带来新发展机遇。

1.“一带一路”正在从中国倡议变成全球共识，为基础设施发展带来政策红利。

在 2017 年 5 月“一带一路”国际合作高峰论坛上，中国承诺加大对“一带一路”建设资金支持，向丝路基金新增资金 1000 亿元人民币，鼓励金融机构开展人民币海外基金业务，规模预计约 3000 亿元人民币。中国国家开发银行、进出口银行将分别提供 2500 亿元和 1300 亿元等值人民币专项贷款，用于支持“一带一路”基础设施建设、产能、金融合作。亚洲基础设施投资银行、金砖国家新开发银行、世界银行及其他多边开发机构将进一步加大对“一带一路”项目的支持。在“一带一路”倡议的引领下，越来越多的国家主动把自己的发展战略规划和“一带一路”倡议进行对接[6]，寻求优势互补。在“一带一路”倡议下，各国形成强大的生产要素传递优势，推进整个地区人力资源整合发展，促进高素质劳动力之间的要素互补和技术输出[7]，带动各国基础设施建设发展。

2. 巴基斯坦、斯里兰卡和孟加拉等国异军突起，或成基础设施发展新机遇。

巴基斯坦、斯里兰卡和孟加拉等国近年来亮点频现，展现出良好的发展前景。巴基斯坦等国在电力、交通、电信等关键领域进行了明确且细致的规划，并鼓励外资和私营资本通过 BOT、PPP 等模式加强对基础设施建设投资。这些国家处于经济增长上升通道，经济增速在 6% 左右，基础设施对经济的拉动力量强劲。跨国基础设施新签合同额也表明，这些国家近两年跨国基建项目热度较高，显示出其发展环境和发展潜力对跨国基建工程承包商的强大吸引力。虽然基础设施发展速度尚不及印度尼西亚等地，但可以预期，巴基斯坦等国在未来将迎来基础设施发展高峰。

3. 可持续发展理念引领基础设施未来发展

随着 2015 年 12 月 12 日《巴黎协定》的通过和 2016 年 1 月 1 日《2030 年可持续发展议程》的正式启动，全球已进入向低碳、绿色和清洁能源化转型的关键时期。建设经济可行、环境友好、社会和谐、治理高效的“可持续的基础设施”越来越成为全球共识。“一带一路”国家将加强合作，推进风能、太阳能等新能源基础设施互联互通，也将在基础设施的规划、投资、建设和运营过程中更加注重环境和生态保护，促进项目与社区的共同发展。

6 包括俄罗斯“欧亚经济联盟”、蒙古国“草原之路”、哈萨克斯坦“光明大道”、欧洲“容克投资计划”、越南“两廊一圈”、澳大利亚“北部大开发”、沙特阿拉伯“2030 愿景”等。

7 在技术互补与输出方面，中国的造修、高铁、通讯技术对中亚、西亚、南亚地区的技术输出，印度的 IT 等高技术劳动力向海湾国家的技术输出等。

二、风险

全球经济虽然正在逐渐走出金融危机阴影，但仍处于需求疲软、增长乏力的深度调整期，贸易和投资保护主义有所抬头，恐怖主义、区域冲突、难民问题等政治安全事件给“一带一路”基础设施建设带来诸多不确定因素。

1. 地缘政治风险威胁跨国基础设施建设安全

部分“一带一路”国家受社会阶级矛盾、民族宗教问题等复杂因素影响，长期处于政局动荡、族群冲突和战乱之中，地缘政治复杂性突出。2015年以来，在多重政治经济利益掺杂的情况下，这些冲突和战争并未出现缓和迹象。中东地区结构性力量失衡加剧，各国党派纷争不断，国家政治蕴含着很大的不确定性；中亚、西亚地区恐怖主义、极端势力、民族主义、宗教主义横行，难民问题、地区争端由来已久；东南亚地区，政治转型正在发生，民粹力量与族群矛盾正在释放，各种意识形态的碰撞和外部势力的干预使得其政策连续性和稳定性受到了很大挑战。

2. 贸易与投资保护主义提高跨国基础设施建设壁垒

“一带一路”国家在发展水平、宗教文化、民族传统等方面差异较大，各国之间尚缺乏长期互信、资源整合的能力。尤其近年来，在世界经济持续低迷的情况下，逆全球化思潮涌动，“阵营性、排他性、碎片化”现象逐渐显现，“一带一路”沿线国家和区域贸易保护主义有复苏之势。政治、文化等非市场因素掺杂其中，进一步加大了贸易保护主义对双边及多边经贸的负面影响。

3. 国家主权风险隐性吞噬跨国基础设施建设收益

“一带一路”国家基础设施建设项目一般具有金额大、周期长、不确定因素多的特点。部分“一带一路”国家存在财政状态欠佳、长期负债、巨额经常项目赤字、外汇储备不足等问题，偿付能力较弱，容易发生国家债务危机。巨大的投资资金与较差的国家主权偿债能力，将会给外国参与者带来资金风险，导致海外建设者承建的项目无法按时收到工程款、收到款项遭遇兑换管制、或遭遇汇率大幅贬值等状况，对资金周转和项目工期造成较大影响。

三、建议

结合发展指数表现及对基础设施发展机遇和风险分析，对跨国基础设施项目参与者、各国政府和金融机构提出建议如下：

1. 项目参与者进一步加强市场研究、政策对接和风险防控

“一带一路”建设覆盖多个国际区域和国家，这些国家在历史文化、政治制度、经济发展水平和国际影响力等方面存在较大差异。投资者和建设者应加强对项目所在国的研究，并根据相关国家特点和企业自身优势研究在基建领域的发展方向。同时，密切关注“一带一路”倡议框架下的政府政策协调，抓住构建国际性基础设施网络、实现基础设施规划和建设协同效应、改进私人资本投资基础设施建设环境等重点，发掘市场机会。此外，对可能出现的风险点进行详细梳理并采取有效的应对措施。

2. 项目参与者广泛拓展合作，提升跨国基建项目成功率。

与上下游企业、东道国企业和专业服务类企业的合作是跨国基建项目参与者规避投资与贸易壁垒、防范政治和社会风险的有效途径，同时也是获取更多市场机会、提升竞争力的明智选择。跨国基建项目参与者可以考虑建立合作与共享机制、结成联合体、成立合资合作实体等方式，进入目标市场，提高获取项目的成功率。

3. 项目参与者注重经济、社会和文化的融合，建设可持续基础设施项目。

基建项目参与者应着眼于项目所在地的实际发展情况和当地人民的现实需求，积极履行社会责任，践行绿色发展理念，注重生态环境保护；尊重当地的风土人情和文化习俗，努力推行本土化，提高社区服务意识。从经济、社会、环境、治理的角度提升“可持续基础设施项目”的理念和实践。

4. 呼吁各国政府间加强对话，为跨国基建参与者搭建平台。

各国政府在“一带一路”基础设施建设中起着规划和引导作用，政府间的政策协调是影响“一带一路”基础设施合作环境的重要因素。如何将各国基础设施发展规划同“一带一路”倡议相结合，实现战略对接、优势互补并逐渐形成合力是各国政府需要协调的重点。建议积极构建多层次政府间宏观政策沟通交流机制，达成合作共识，共同推动“互联互通”重大项目的实施。同时，呼吁政府适当调低市场准入门槛，针对基础设施建所涉领域设定相对宽松的准入制度，便利基础设施领域国际合作的开展，实现互利共赢。

5. 金融机构创新与合作，多种方式支持跨国基础设施建设。

金融危机过后的基建领域资金瓶颈问题仍然没有得到突破，目前面临的问题已非传统金融手段所能解决，亟待金融机构进行更多的金融创新来弥补。呼吁深化各国金融机构合作，扩大双边本币互换的规模和范围，降低跨国企业的交易成本；希望开发性金融机构发挥积极作用，加强与多边开发机构的合作；通过推动支付体系合作和普惠金融等途径，促进金融市场相互开放和互联互通；支持和鼓励民间资本进入国际基建领域，参与投资与运营。

附录1：“一带一路”国家基础设施发展

国家	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
总指数	100	102	121	105	101	118	119	110	136	117

附录2：“一带一路”国家基础设施发展指数：沿线国家排名

国家	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
印度尼西亚	171	142	173	187	202	243	195	198	220	195
伊朗	147	129	172	103	159	152	131	94	145	171
印度	202	158	135	149	135	163	140	134	152	170
越南	108	135	153	156	133	180	183	159	225	146
新加坡	118	142	164	136	129	149	149	141	161	145
俄罗斯	154	135	139	148	134	139	148	125	132	144

国家	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
巴基斯坦	96	90	116	102	98	121	114	126	161	139
保加利亚	87	96	135	96	97	116	140	106	134	136
马来西亚	116	99	128	117	130	129	131	124	155	135
以色列	102	110	133	106	117	129	141	122	160	133
沙特阿拉伯	116	110	134	120	106	142	129	119	148	129
科威特	95	102	124	98	100	116	117	113	160	127
阿联酋	110	128	162	112	112	118	125	114	143	126
卡塔尔	93	106	121	92	127	126	125	117	141	125
斯里兰卡	90	74	112	82	82	112	104	103	131	124
菲律宾	120	95	122	107	99	133	149	115	141	124
捷克	122	113	123	110	131	118	117	114	150	123
匈牙利	90	98	120	98	97	109	113	101	129	123
亚美尼亚	70	76	106	78	75	101	99	111	126	123
泰国	100	95	113	111	105	153	125	112	143	120
柬埔寨	84	97	153	92	106	136	132	109	126	120
土耳其	130	110	118	125	107	124	126	120	136	120
塞尔维亚	78	110	118	100	109	115	112	106	118	119
罗马尼亚	104	114	135	98	99	113	127	118	130	118
波兰	118	134	135	116	117	119	137	123	141	117
老挝	88	77	105	84	76	109	100	93	120	117
哈萨克斯坦	90	97	98	96	91	115	113	106	134	115
孟加拉国	79	78	98	104	80	106	101	89	126	115
克罗地亚	108	94	122	100	99	127	114	102	140	115
巴林	89	370	176	97	128	111	117	118	157	114
塞浦路斯	108	98	116	96	126	115	112	107	129	114

国家	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
缅甸	84	87	111	96	92	113	111	102	123	113
格鲁吉亚	77	80	116	81	82	124	104	104	131	112
斯洛伐克	93	101	114	88	97	109	109	101	126	111
尼泊尔	81	84	107	90	89	106	109	98	126	111
蒙古	81	86	106	94	85	112	109	98	127	111
阿塞拜疆	85	88	113	99	92	112	116	104	132	110
摩尔多瓦	81	79	101	84	81	100	105	93	119	110
埃及	95	87	126	108	86	115	106	111	141	110
文莱	75	90	104	92	89	106	110	96	124	109
黑山	81	83	111	86	98	105	107	98	125	109
希腊	105	99	116	95	109	107	108	94	119	109
拉脱维亚	81	85	123	82	86	99	106	92	119	108
马其顿	80	85	109	86	91	116	108	109	132	107
乌兹别克斯坦	88	113	141	111	99	105	113	123	129	107
立陶宛	90	87	94	86	87	106	104	97	119	107
斯洛文尼亚	87	99	114	88	98	105	112	107	128	106
波黑	79	86	105	95	91	106	109	99	121	106
阿尔巴尼亚	106	111	111	86	94	98	104	92	122	104
马尔代夫	74	81	102	81	82	98	106	97	126	104
乌克兰	90	101	98	91	81	106	103	84	119	104
塔吉克斯坦	83	83	142	82	94	108	109	126	169	103
吉尔吉斯斯坦	80	78	100	79	81	103	108	98	125	103
土库曼斯坦	77	85	105	89	83	101	104	101	127	103
黎巴嫩	83	102	109	92	105	111	118	107	128	102

国家	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
约旦	316	81	107	305	91	104	133	103	125	101
爱沙尼亚	104	85	98	110	87	123	106	96	121	101
伊拉克	67	71	103	89	87	116	123	107	133	101
不丹	74	88	105	83	82	100	100	92	120	100
也门	79	78	99	82	79	96	102	88	119	100
阿曼	92	88	141	100	98	129	118	108	134	99
白俄罗斯	99	81	99	93	71	83	107	92	99	98
阿富汗	74	75	100	84	80	99	104	89	117	94

附录3：“一带一路”国家基础设施发展指数：葡语国家排名

国家	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
巴西	171	154	188	229	200	204	205	176	153	168
葡萄牙	115	147	130	111	122	126	126	113	156	144
安哥拉	117	136	142	102	88	111	109	114	162	105
莫桑比克	76	81	122	84	83	103	105	100	132	104
圣多美和普林西比	76	86	104	107	85	100	105	117	126	102
佛得角	68	74	96	79	78	96	100	86	115	100
东帝汶	78	83	104	125	82	94	101	139	128	96
几内亚比绍	73	69	89	83	70	90	96	86	111	91

附录4：发展环境排名（TOP15）

国家	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
新加坡	156	166	167	163	169	165	164	165	169	166
葡萄牙	162	190	143	136	158	139	134	130	132	133

国家	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
俄罗斯	165	135	148	147	146	143	146	130	121	126
巴西	153	146	146	161	154	141	139	130	117	120
科威特	99	99	105	96	104	100	97	108	149	119
以色列	117	127	148	117	138	118	119	114	120	115
波兰	132	143	137	120	126	118	121	113	120	115
克罗地亚	153	121	135	113	130	115	112	111	115	113
保加利亚	115	112	158	109	118	133	111	109	115	113
塞浦路斯	113	118	112	113	162	122	114	111	115	113
土耳其	116	108	109	106	108	101	105	105	108	107
匈牙利	119	124	125	113	122	109	112	106	109	107
沙特阿拉伯	102	107	109	109	108	118	108	109	125	107
斯洛文尼亚	114	114	114	109	121	112	109	104	110	105
捷克	157	114	116	108	123	109	108	104	108	105

附录5：发展潜力排名（TOP15）

国家	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
阿联酋	86	85	86	84	80	75	77	78	73	86
缅甸	59	59	60	63	62	63	70	70	59	76
印度	61	60	65	63	63	63	66	70	62	74
尼泊尔	60	59	63	63	63	63	66	67	62	73
俄罗斯	54	52	60	54	55	56	60	55	54	72
越南	59	58	60	61	61	61	65	67	60	72
马来西亚	58	57	59	59	60	60	63	65	59	71
巴西	55	54	58	57	56	56	59	60	55	71
印度尼西亚	57	56	62	59	60	59	63	64	58	70

国家	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
乌克兰	55	54	53	53	54	55	58	53	56	69
也门	56	57	57	56	57	56	60	56	56	69
阿塞拜疆	55	59	59	59	60	61	64	67	58	69
蒙古	57	57	60	60	61	61	64	66	61	69
菲律宾	57	57	58	59	60	60	66	67	59	68
土耳其	55	53	61	56	57	59	60	65	57	68

附录6：发展趋势排名（TOP15）

国家	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
印度尼西亚	187	131	185	228	237	332	236	240	289	224
伊朗	152	122	205	65	171	177	171	112	173	200
印度	239	149	102	133	104	165	115	103	136	165
巴西	135	107	171	241	191	211	213	162	135	145
越南	70	126	167	179	135	216	212	164	303	132
巴基斯坦	39	41	91	62	56	107	84	104	146	124
斯里兰卡	55	30	78	37	34	94	75	69	131	107
以色列	52	57	81	56	56	101	119	86	160	105
保加利亚	24	42	74	47	40	63	130	62	118	101
亚美尼亚	22	29	72	36	32	77	72	45	111	100
菲律宾	62	48	99	76	55	128	102	87	137	99
卡塔尔	27	53	77	59	88	95	94	67	122	98
老挝	45	31	80	42	31	91	75	52	107	97
马来西亚	68	34	92	75	47	98	100	75	137	96
孟加拉	30	29	72	85	36	90	75	48	123	95

附录 7 ： 指数编制方法

本指数采用层次分析法编制，把决策过程中定性与定量因素有机结合，利用较少的定量信息使决策的思维过程数学化。

“ 一带一路 ” 国家基础设施发展指数的生成过程主要分为五个阶段，即缺失值处理、数据标准化、权重设定、指数计算与指数验证。具体计算步骤如下：

步骤 1 数据处理

在数据采集过程中，存在统计口径不一致、数据不公开等因素，导致指数模型需求数据存在部分失真、缺失现象。本指数采用的验证方法主要有：常识判断、异常值检验及趋势检验等。针对缺失数据，补缺方法以链式方程多元插值为主，聚类分析、线性回归分析、邻近均值分析、相关性分析及移动平均为辅。为提高数据稳健性，在上述补缺数据基础上，对缺失过于严重数据项增加数据不透明惩罚因子，进一步修正缺失数据以平滑整体数据质量。

步骤 2 数据标准化

为实现各数据项之间信息一致可比，对 “ 一带一路 ” 各国十年的相关指标数据进行标准化处理。设 i 为 “ 一带一路 ” 国家（i=1,2，……，71），j 为年份（j=2007,2008，……，2016）。具体分为三步：

（1）去量纲化，消除指标之间计量单位和数量级的差异。

$$Y_{i,j} = 100 \times \frac{X_{i,j}}{X_{07}}$$

其中，X(i,j) 表示第 i 个国家、第 j 年数据；$\bar{X}_{07}$ 表示所有观察国 2007 年该指标期望；Y(i,j) 表示第 i 个国家、第 j 年去纲量数据。

（2）同趋势化，实现逆向指标和适度指标同趋势化。

（3）归一化，保证数据落入标的区间。

$$Y_{i,j} = \frac{X_{i,j} - X_{min,j}}{X_{max,j} - X_{min,j}} \times 100.$$

其中，X(i,j) 表示第 i 个国家、第 j 年数据；X(max,j) 表示所有观察国第 j 年最大值；X(min,j) 表示所有观察国第 j 年最小值；Y(i,j) 表示第 i 个国家、第 j 年归一化数据。

步骤 3 权重设定

由于影响基础设施发展的因素以及各个国家对区域发展的贡献有所不同，需要运用层次分析法（AHP），即定性和定量相结合的方式确定各层级指标权重和相关国家的重要性排名。针对发展指数指标体系的三个层级的结构模型，大公和余包商会通过多轮专家评审会的方式，利用数学方法对每层及每层指标的重要性进行两两比较，确定每一层次全部指标相对重要性次序的权值 w_{α}；最后通过综合计算各层指标相对重要性的权值，得到三个层级的相对重要性次序的组合权值，以此作为评价依据。

步骤 4 指数测算

将各国每年的 Y(i,j) 值乘以各指标权重得出每个国家每一年的基础设施发展分指数。

$$Z_{i,j} = w_{\alpha} \times Y_{i,j}.$$

再将分指数计算合并得出国家基础设施发展总指数。总指数涵盖每年各国基础设施建设的总体情况和十年间各国基建发展整体趋势。

步骤 5 指数验证

通过常规方法计算出的指数可能存在逻辑错误或不合常理等情况，因此须验证模型是否过度或欠拟合，并结合专家评审意见，进行指数测算结果检验，调整指数模型相关参数。

“一带一路”国家基础设施发展指数报告

The Belt and Road Infrastructure Development Index Report

中国对外承包工程商会
China International Contractors Association
TEL：+86-10-59765284
FAX：+86-10-59765204
E-mail：consulting@chinca.org

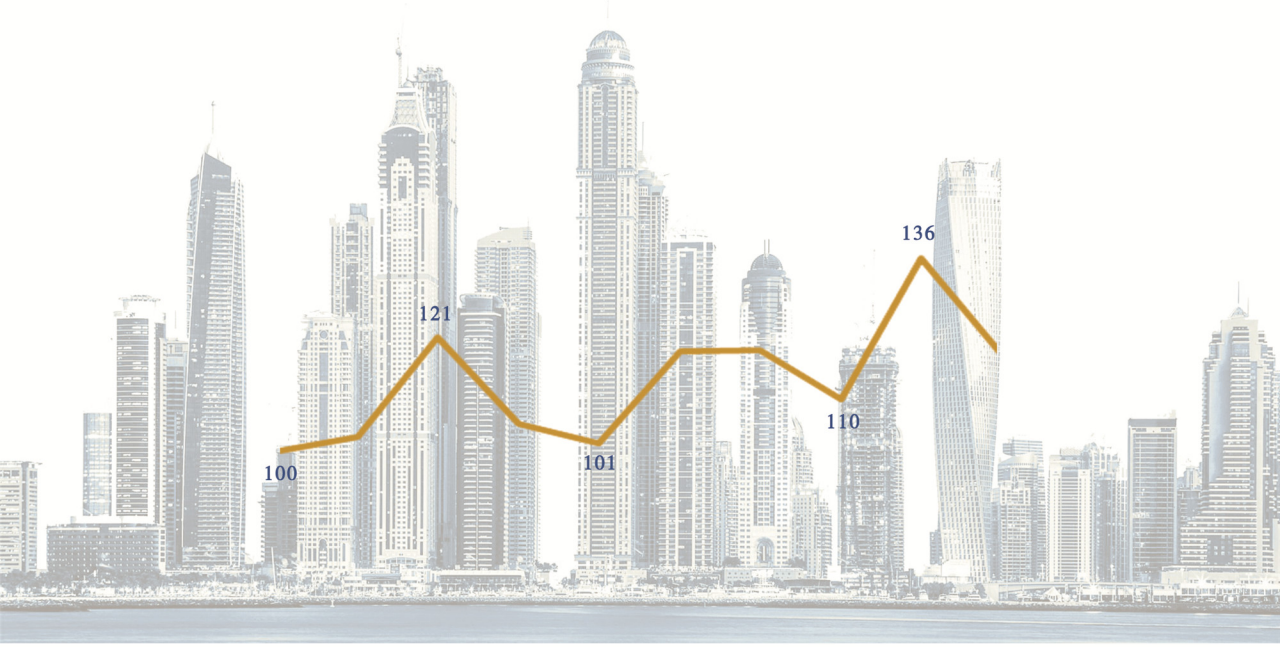
大公信用信息服务有限公司
Dagong Credit Information
TEL：+86-10-51087768
FAX：+86-10-84583355
E-mail：Dagongci@dagongcredit.com

BRIDI

“一带一路”国家基础设施发展指数报告

The Belt and Road Infrastructure Development Index Report

2017



中国对外承包工程商会
CHINA INTERNATIONAL CONTRACTORS ASSOCIATION

技术支持 Technical Support 大公信用信息服务有限公司 DAGONG GREDIT INFORMATION SERVICES CO.,LTD

数据支持 Data Support BMI Research A FitchGroup Company

PREFACE

Nowadays, as the world multi-polarization, economic globalization, information socialization and cultural diversification are gaining momentum, all nations are more closely intertwined in political, economic and cultural dimensions than ever before. The human society is embracing great challenges in development and progress. The Initiative of "Jointly Building Silk Road Economic Belt and 21st-Century Maritime Silk Road (hereinafter referred to as 'the Belt and Road or B&R')", proposed by the Chinese government in 2013, has immediately received extensive attention and high appreciation from the international community. Up to now, more than 100 countries and international organizations around the world actively support and participate in the Initiative.

Infrastructure connectivity, a priority for implementing the Initiative, has been strengthened over the past four years. A number of cooperative projects in the sectors of transportation, energy and utilities have been put on the agenda. At the Belt and Road Forum for International Cooperation convened on May 14, 2017 in Beijing, the world's political leaders reached a series of consensuses on further enhancing pragmatic partnership over infrastructure connectivity; supporting the construction of multi-modal comprehensive corridors and international trunk passageways, including New Eurasian Continental Bridge, Northern Sea Route and Central Corridor; and gradually building a global infrastructure network. Tremendous opportunities will be opened up to international infrastructure investors, contractors and other stakeholders worldwide.

However, given the uneven infrastructure development and varying political & economic contexts along the Belt and Road, all companies involved in this Initiative are faced with considerable challenges and uncertainties and need to intensify researches to ensure steady and sound progress of the investment and construction projects.

In view of this, China International Contractors Association has joined hands with Dagong Global Credit Rating Group to conduct the research of "The Belt and Road Infrastructure Development Index (BRIDI)". The aim is to develop an in-depth insight into the status quo, characteristics and trend of the international infrastructure market, capture investment opportunities, stand up to potential challenges, offer supportive information for domestic and international infrastructure investors, contractors and all other related parties to expand international markets and contribute positively to the global infrastructure development. The Index will be released annually as an important finding on the International Infrastructure Investment and Construction Forum in Macao, and build an infrastructure-related information service platform for index analysis and dynamic data sharing.

The research took almost a year and contained tens of thousands of data over a time span of ten years. It was the result of dozens of expert meetings and corporate seminars and took advises from over 30 experts from related government departments, authoritative national research institutes and key corporate members. Our research team developed a trailblazing index model to envision the future of a country in infrastructure development over the next 2or 3 years based on the perspective of environment, potential and trend. This year, altogether 71 Belt and Road as

well as CPLP countries were chosen for this research. As more and more nations are expected to play an active role in the Initiative, a wider spectrum of countries will be included in future studies. Now, we are here to publish the accomplished 2017 index research and analysis report.

This report consists of five parts. The first part introduces the meaning, framework and research scope of BRIDI. The second part contains a general analysis about BRIDI, especially the characteristics of future infrastructure development along the Belt and Road. The third part analyzes factors that may influence infrastructure development to enable an understanding of the characteristics and inherent logic of the infrastructure industry from the perspectives of development environment, potential and trend. The fourth part carries an analysis of individual sectors of the industry. The last part explains the opportunities and challenges for the Belt and Road infrastructure development and puts forward suggestions.

We hope that each of our readers, especially international infrastructure industrial players, could derive benefits from this research. Due to the limited time and expertise, careless omissions or inadequate statements may happen in this research and analysis report. Your comments and suggestions are highly appreciated for us to improve in future studies and reports.

In the end, we want to express gratitude to the following partners for their vigorous supports and assistance for this research and report: Department of Outward Investment and Economic Cooperation, The Ministry of Commerce of China; Macao Trade and Investment Promotion Institute; Dagong Global Credit Rating Group; Business Monitor Research (BMI); Development Research Center of the State Council; Institute of Territorial Development and Regional Economics Research, NDRC; SASAC Research Center, Chinese Academy of International Trade and Economic Cooperation, the Ministry of Commerce; Chinese Academy of Social Sciences; University of International Business and Economics; China Export & Credit Insurance Corporation; China Development Bank; The Export-Import Bank of China; China Communications Construction Company Limited; China State Construction; China National Technical Import & Export Corporation; Metallurgical Corporation of China Ltd.; CGCOC Group; and Alliance PKU Management Consultants Ltd., etc. Our sincere thanks also go to each individual who has contributed positively to this research and paper.

China International Contractors Association

May 2017

CONTENTS

Appendix

BRIDI 2017—REPORT

I. About BRIDI

To press ahead with the Initiative, offer supportive information for Chinese companies as well as international investors, contractors and operators to make decisions on cross-border infrastructure projects, and enable all related parties to understand trends, discover opportunities and evade risks, China International Contractors Association (hereinafter referred to as "CHINCA") has joined hands with Dagong Global Credit Rating Group (hereinafter referred to as "Dagong Global") and developed "The Belt and Road Infrastructure Development Index" (hereinafter referred to as "Development Index", "the Index" or "BRIDI").

Upon repeated studies over other existing index models and factors in relation to international infrastructure development, our research team has defined the scope of BRIDI and built our own research model.

1. Definition and Scope of BRIDI

"Infrastructure" refers generally to economic projects that can directly or indirectly improve output or productivity[1]. In this research, infrastructure facilities are broken down into four major categories, namely, transportation, energy, utililties and buildings, with reference to the classification of the World Bank and Business Monitor International (BMI). Here, the transportation facilities include roads, railways, airports and ports, among others; the energy mainly refers to oil & gas and electricity; the utililties refers to water conservancy projects and communication networks; and buildings are those projects meant for civil and commercial purposes.

The current research is angled towards infrastructure development in target countries, in a sense of assessing how far it can go in the future rather than describing how much it has achieved up to now. BRIDI, therefore, is to identify the potential of a countryto develop infrastructure facilities in the next two or three years, based on an analysis of some major factors that may influence such development in that country. In addition to country-specific development indexes which are taken as the foundation and heart of this research, we have also calculated and analyzed the gross BRIDI and some sub-indexes.

Excluding China, 63 Belt and Road countries[2] are covered in this research. In addition, the Portuguese-speaking countries have strong complementarities with B&R countries in the field of resources, technology and market during the infrastructure construction. The two sides have made initial progress in the transportation, electricity, petrochemical and other areas of cooperation and future cooperation space is huge. We have also worked over 8 CPLP countries to support the forthcoming International Infrastructure Investment and Construction Forum in Macao (China), which is a cooperation platform for Portuguese-speaking countries. Therefore, altogether 71 countries and regions (hereinafter referred to as "the Belt and Road countries") are selected for the 2017 BRIDI research. As more and more nations play an active role in the Initiative, a wider spectrum of countries will be included in BRIDI in the future.

1. Encyclopedia of Economics, 1982, McGraw-Hill book Company.

2. Though also along the Belt and Road, Pakistan and Syria are not included in this index research due to a severe lack of data.

Countries Covered in the 2017 BRIDI Research	
63 Belt and Road Countries	Mongolia, Singapore, Malaysia, Indonesia, Myanmar, Thailand, Laos, Cambodia, Vietnam, Brunei, Philippines, Iran, Iraq, Turkey, Jordan, Lebanon, Israel, Saudi Arabia, Yemen, Oman, UAE, Qatar, Kuwait, Bahrain, Greece, Cyprus, Egypt, Kazakhstan, Uzbekistan, Turkmenistan, Tajikistan, Kyrgyzstan, India, Pakistan, Bangladesh, Afghanistan, Sri Lanka, Maldives, Nepal, Bhutan, Poland, Lithuania, Estonia, Latvia, Czech, Slovakia, Hungary, Slovenia, Croatia, Bosnia and Herzegovina, Montenegro, Serbia, Albania, Romania, Bulgaria, Macedonia, Russia, Ukraine, Belarus, Georgia, Azerbaijan, Armenia, Moldova
8 CPLP Countries	Portugal, Brazil, Angola, Mozambique, Guinea-Bissau, Cape Verde, East Timor, Sao Tome and Principe

2. BRIDI Model

Those who affect the infrastructure prospects are not limited to external factors, but also include internal dynamics and trends of the industry. After comparing and analyzing various factors, we have built an index model based on three calculated sub-indexes of infrastructure development environment, development potential and development trend, which further include 8 secondary indicators and 33 tertiary indicators.

a) Development environment is the primary factor that may affect cross-border infrastructure development and a major source of risks associated with actual cross-border infrastructure investment or construction.

The sub-index of development environment encompasses 4 secondary indicators in political, social, financial and business dimensions. The **political climate** is associated with political stability, clarity in infrastructure development strategy, policy continuity, international relations, industrial openness and other indicators. The **social climate** refers to public security, culture and other social elements that may secure or hinder smooth progress of infrastructure projects. The **financial climate** looks into the sustainability of liquid capital and the difficulty in capital recovery for cross-border infrastructure projects, it is reflected through exchange rates, commodity prices, openness of capital market, national debt risks and other indicators. The **business climate** refers to any factors that may influence the business efficiency of cross-border contractors and investors, including, among other indicators, the coverage of economic laws, administrative efficiency, ease of doing business and taxation burdens.

b) Development potential measures any long-term forces that drive infrastructure development in a country.

The sub-index of development potential involves 2 secondary indicators: market demands and production factor resources. The **market demands** indicator is defined by the domestic per capita infrastructure ownership and the needs for infrastructure facilities to align with the current economic development and international communications. The **production factor resources** indicator looks into the availability of lands, raw materials, labor forces, funds and other factor resources for cross-border infrastructure projects.

c) Development trend reflects the run of infrastructure development and implies where the infrastructure industry will head towards in the short term.

The "development trend" sub-index is composed of 2 secondary indicators: infrastructure growth rate and the passion for cross-border infrastructure projects. The **infrastructure growth rate** is measured by the annual output of infrastructure-related subsectors and the growth rate of infrastructure investment in a country. The **passion for cross-border infrastructure projects** means to which degree an infrastructure market is favored by overseas contractors. It can be interpreted by the number and value of newly signed overseas infrastructure contracts.

The BRIDI is an annual release and is calculated through the index model based on the data and information about all indicators from the previous year. As the year 2017 marks the first release of BRIDI, with the aim to observe the changes in a country and the differences between various countries, we have applied the index model to 2006-2016 data and information and set the 33 average figures of the indicators in 2007 as the benchmarks, and derived the matrix of infrastructure indexes for 71 countries thereafter. Based on the counties indexes, we further calculated the gross Belt and Road Infrastructure Development Index.

3. BRIDI's Characteristics

Given its concept and calculation results, the BRIDI reveals the following characteristics:

a) Both lateral comparison and vertical comparison are conducted for a comprehensive view of the infrastructure development among the Belt and Road countries. The vertical comparison between BRIDIs of the last ten years reveals the general trend of infrastructure development along the route; while the lateral comparison between the Belt and Road countries helps rank specific regions and countries in terms of infrastructure development.

b) Both internal and external factors are studied for a multi-level view of the elements that may influence the Belt and Road infrastructure development. The aim is to identify the internal and external driving forces and risks as well as the opportunities and restrictions of each country for infrastructure development through an analysis of its environment, potential and trend.

c) Both the status quo and future trend are analyzed for a forward-looking understanding of the opportunities and risks facing the Belt and Road countries in developing infrastructure facilities. An investigation into, among others, the status quo, driving forces and growth rates of the infrastructure industry in related countries will reveal future prospects and enable all parties involved in the overseas infrastructure projects to make corresponding plans and strategies.

II. General Features of B&R Infrastructure Development

The BRIDIs for the year 2017 and the past 9 years indicate the following characteristics of the Belt and Road infrastructure development:

1. Infrastructure industry shows an upward trend amidst fluctuations.

The gross Belt and Road Infrastructure Development Index (gross BRIDI) is a weighted average of respective development indexes of all countries under current research. The distribution of gross BRIDIs over the years shows an upward trend amidst fluctuations in the Belt and Road infrastructure development. This stable growth will continue in the future.

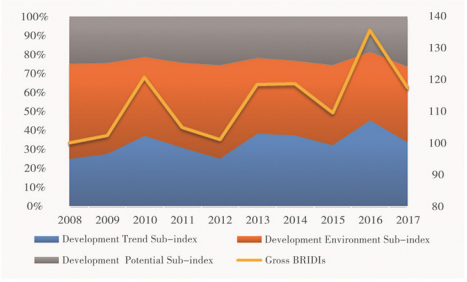


Fig. 2.1: Gross BRIDIs (2008–2017) [3]

Historical data also revealed counter-cyclical features of infrastructure development. In 2009 and 2015, as weighted down by global financial crisis and economic slumps in emerging markets, the infrastructure industry sank to a low-ebb. However, since the governments intensified infrastructure inputs as a means to spur economic recovery, the gross BRIDI hit new peaks of 119 and 136 in 2010 and 2016, respectively. Though this index eased back to 117 along the stabilizing global economy this year, the infrastructure industry will maintain a momentum of steady growth with sustained governmental inputs in the current economic cycle. The Belt and Road Forum for International Cooperation, held in Beijing in May, 2017, witnessed more than 270 concrete fruits of cooperation and a batch of cooperation plans on the building of infrastructure and financial network among the B&R countries. This has provided fresh impetus to economic globalization in the new era. New opportunities will be opened up for the international infrastructure industry.

3. To explain the sub-indexes changes (left axis) and the gross index development trend (right axis).

2. The performance in ASEAN and CEE stands out

The Index shows that the Belt and Road countries see varying prospects in infrastructure development. The 2017 BRIDI Top 10 list by country includes Indonesia, Iran, India, Brazil, Vietnam, Singapore, Russia, Portugal, Pakistan and Bulgaria. To be specific, Indonesia took the first place with a significantly higher sub-index of development trend than the other countries. As a developed country, Singapore ranked 6th with the highest sub-index of development environment. In addition, Pakistan, Iran and Saudi Arabia also ranked high and deserve attentions from all the parties concerned.

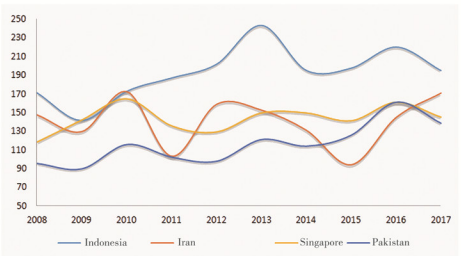


Fig. 2.2: BRIDIs of Countries (2008–2017)

Table 2.1: 2017 TOP 20 Countries by BRIDI

Rank	Country	2017BRIDI	Rank	Country	2017BRIDI
1	Indonesia	195	11	Malaysia	135
2	Iran	171	12	Israel	133

Rank	Country	2017BRIDI	Rank	Country	2017BRIDI
3	India	170	13	Saudi Arabia	129
4	Brazil	168	14	Kuwait	127
5	Vietnam	146	15	UAE	126
6	Singapore	145	16	Qatar	125
7	Russia	144	17	Sri Lanka	124
8	Portugal	144	18	Philippines	124
9	Pakistan	139	19	Czech	123
10	Bulgaria	136	20	Hungary	123

All in all, ASEAN and Central & Eastern Europe (CEE) are standing out as the most promising regions. In 2017, the average BRIDI for the 71 target countries reached 117.4, significantly lower than the ASEAN average of 152.2 and the CEE average of 128.3.

Fig. 2.3: Distribution of BRIDI Heats

But these two regions are not exactly the same. Most ASEAN countries belong to the developing world. As the 3rd largest populated region (next only to China and India), ASEAN is the 5th largest economy (next only to EU, USA, China and Japan) in the world. The infrastructure stock in ASEAN can hardly afford the increasingly vibrant economic growth, leading to huge gaps in the sectors of energy, transportation, utilities and buildings. Driven by huge demands, the ASEAN countries have registered high scores of BRIDI in general. On the other hand, the CEE countries lag behind their European neighbors in infrastructure development, and see an urgent need for infrastructure improvement and upgrading. Thanks to stable social, political and business climates for infrastructure development, the CEE countries are performing well in BRIDI ranking.

Table 2.2: 2017 BRIDI Ranking of ASEAN and CEE Countries

ASEAN	2017 BRIDI	Environment	Potential	Trend
Indonesia	195	32	10	1
Vietnam	146	41	7	5
Singapore	145	1	67	25
Malaysia	135	18	8	14
Philippines	124	54	16	11
Thailand	120	19	6	38
Cambodia	120	45	21	18
Laos	117	62	28	13
Myanmar	113	50	2	35
Brunei	109	20	59	49
CEE	**2017BRIDI**	**Environment**	**Potential**	**Trend**
Bulgaria	136	9	54	9
Czech Republic	123	15	27	24
Hungary	123	12	52	20
Serbia	119	29	39	21
Romania	118	27	29	28
Poland	117	7	36	63
Croatia	115	8	56	58
Slovakia	111	25	47	42
Montenegro	109	28	42	52

CEE	2017BRIDI	Environment	Potential	Trend
Latvia	108	30	51	47
Macedonia	107	36	45	48
Lithuania	107	35	44	60
Slovenia	106	14	62	69
Bosnia and Herzegovina	106	24	53	68
Albania	104	39	40	64
Estonia	101	33	61	70
From green to red: the redder the color, the lower the rank.				

Portuguese-speaking countries stand out as a whole. In most countries, development environment remains stable and the demand for infrastructure has increased in recent years. Angola, Brazil and Timor-Leste have risen significantly in the field of infrastructure industry, among them, Brazil grows fastest and Angola attracts the most attentions of international infrastructure players.

3. Transportation and electricity sectors will become a major powerhouse for international infrastructure development.

The transportation sector supports the Belt and Road infrastructure development and is where we start and prioritize in setting up all-dimensional, multi-tiered and composite connectivity networks. The availability of electricity facilities is a prerequisite for other infrastructure to play their role, and may affect the national economy as a whole. As shown by the 2017 indexes and indicators, the transportation and electricity sectors registered a faster growth than the overall infrastructure industry (see Fig. 2.4) and became major forces to fuel the infrastructure development. In view of this, many "B&R" countries have focused their infrastructure plans on transportation and electricity facilities. It is expected that these two sectors will maintain a fast growth to lead infrastructure development.

4. A sign of expansion in infrastructure markets is shown in B&R countries.

Since no major changes are expected out of the production factor resources in the short and medium term, the market demands will remain a dominant element that affects the development potential sub-index. The past decade has unlocked growing potentials among the Belt and Road countries (see Fig. 2.5), which have intensified international investment, imports & exports, cross-border tourism and other economic exchanges after the 2008 financial crisis to drive the economy and boost infrastructure demands. In 2017, the sub-index scored 135, far higher than the last year, where nearly 77% was contributed by the indicator of market demands (104). Generally speaking, the "B&R" infrastructure potentials are enormous and will keep going up in the future.

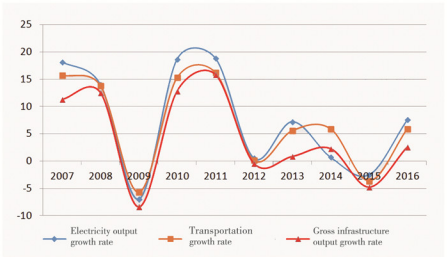


Fig. 2.4: Output Growths of the Transportation, Electricity Sector

Source: BMI, collected by our research team

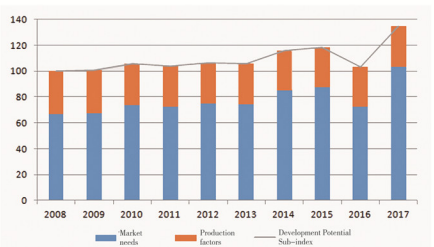


Fig. 2.5: Trend of B&R Development Potential Sub-index

5. Passion for cross–border infrastructure projects is soaring.

The infrastructure growth rate and the passion for cross–border infrastructure projects are two factors to explain the short–term trend of infrastructure development in a country. As data suggest, there has been a soaring passion among overseas infrastructure contractors towards the Belt and Road markets in the recent two years, as proven by a skyrocketing number and value of new infrastructure contracts. To be specific, the new contract value experienced a sudden 150% y–o–y spurt in 2015 and remained high in 2016 despite a slight fall over the previous year. After comprehensive comparisons between infrastructure data for the past two years, we found that some ASEAN and South Asian countries are exhibiting a sound trend of infrastructure development, including Vietnam, Indonesia, Pakistan and India, etc.

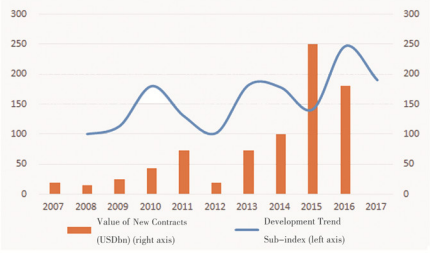


Fig. 2.6: B&R Development Trend Sub–index and New Contract Value of Cross–border Infrastructure Projects

6. Changing political and financial climates affect the infrastructure development negatively.

The development environment is expressed in political, social, financial and business dimensions. Political and financial climates are the most important for infrastructure development in a country. Over the last few years, the Belt and Road countries have maintained relatively stable social and business climates amidst political and financial changes. In 2015, the sub–index of development environment drifted towards the downside, as harassed by a declining political indicator and noticeable fluctuations in financial indicator (see Fig. 2.7).

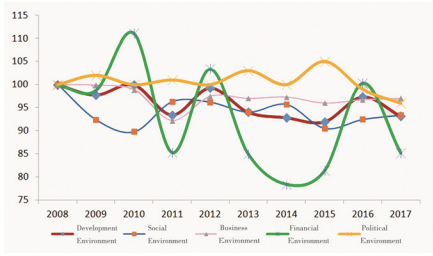


Fig. 2.7: Trend of B&R Development Environment Sub–index

The political climate has been skewing downwards since 2015 amidst geopolitical complexities, rising trade protectionism, de–globalization trends, religious conflicts, ethnic confrontations and worsened relations between some countries. Meanwhile, the financial climate has also undergone drastic changes as a result of exchange rate volatility, budget deficits and increased sovereign debt insolvency risks in some countries. Though intensified fights against international crimes, stricter border controls as well as uplifted administrative and business efficiencies have translated into improved social and business climates. But, low tides in the political and financial climate are expected to continue in the short run. This will become a disadvantage to infrastructure investment and financing and, to some extent, put the sustainable development of Belt and Road infrastructure in jeopardy.

III. Analysis on Factors that may Influence B&R Infrastructure Development

While the environment is the context and foundation for a country to develop infrastructure facilities, the potential serves as the driving force and guarantee, and the trend functions as a barometer. To obtain a deep understanding, we will look into the Belt and Road infrastructure development from the perspective of three primary indicators:

1. The Belt and Road countries vary greatly in development environment. In despite of gradual improvements in social and business dimensions, trade protectionism is gaining ground in some countries, leading to high barriers in the infrastructure industry.

Historical data revealed noticeable discrepancies in development environment among the Belt and Road countries. In spite these gaps are narrowing because of gradual improvements in social and business dimensions in some countries, the sub-index of development environment has shown a declining trend in general as dragged down by political and financial climates.

Table 3.1: 2017 Top 10 Belt and Road Countries by Development Climate Sub-index

Rank	Country	2017
1	Singapore	166
2	Portugal	133
3	Russia	126
4	Brazil	120
5	Kuwait	119
6	Israel	115
7	Poland	115
8	Croatia	113
9	Bulgaria	113
10	Cyprus	113

a) Most Belt and Road countries, except for some have set a high threshold for infrastructure market access, and enjoy political stability.

The political climate is of great significance to infrastructure investment and construction. Most countries along the Belt and Road have maintained political stability, but some have recorded a decline in the indicator of political climate as harassed by regime changes, ethnic confrontations, religious conflicts and wars. In 2017, the top 10 countries in terms of political climate were mostly from the Central and Eastern Europe. Thailand is in the grip of political unrest and military coups, and the 2017 election will further increase its political risks. In South Asia, the political stability has been comprised by ethnic conflicts. Torn by wars and geopolitical conflicts, Ukraine, Syria, Afghanistan and some other countries have also suffered from political instability and policy discontinuity.

Though most countries have detailed national plans and infrastructure development schemes in place, they've also set infrastructure barriers. With a strong sense of local protectionism, some countries have raised the threshold for foreign investors to access local infrastructure market through strict limits on investment scale, financing source and investment mode, etc.

Table 3.2: Infrastructure Market Access System in Some Countries

Country	Access System
Mongolia	1. No foreign natural persons are allowed to undertake contracting projects in Mongolia. 2. An FSOE must fulfill the FIRRD (Foreign Investment Regulation and Registration Department)'s approval procedures for investments exceeding a 33 percent or more interest in Mongolian-incorporated legal entities which operate in the sectors of minerals, finance and telecommunications.
Philippines	The Philippines implements trial "accreditation management" over foreign investors. All construction companies are required to carry a 40% foreign ownership ceiling and obtain a utility license before they are allowed to undertake any infrastructure projects (hydropower, communications and transportation, etc.) in the Philippines. Foreign companies are not allowed to undertake construction works funded by local Philippine investors.
Ukraine	Ukraine implements a construction market access system. Foreign design and construction companies must register their presence as local entities and submit related design and engineering qualification materials to a specialized committee under the Ministry of Regional Development, Building and Housing of Ukraine for approval and permits before they can undertake any engineering projects in Ukraine. The procedure takes many efforts and a long time (about 6 months to one year)

Country	Access System
Israel	Public engineering projects above the threshold of 5 million SDR are only open to signatories to the Government Procurement Agreement.
Laos	1. Domestic cements, reinforcing steel bars, washing-up liquids, PVC tubes, galvanized tiles and cement tiles are protected. 2. The term of land lease can be up to 50 years, depending on the projects, industries, scales and characteristics of foreign investment. Renewal options may be available upon government approval and decision.
Malaysia	1. As stipulated by the Malaysian laws, WFOEs shall not be issued with the A-level building contractor license which, however, is a must for an entity to tender as the general contractor for government-led RM100mn+ projects; 2. Foreign engineering companies are not allowed to assume the role of general contractor on their own. They can only subcontract business from local companies.

Source: MOFCOM's Country/Region-Specific Guidance on International Investment and Cooperation, collected by our research team.

b) While ASEAN enjoys a better social climate, South Asia expects an improvement; some countries call for greater ease of border crossing.

The social climate, especially social security, cultural integration and medical & health service, also has a close bearing on cross-border infrastructure development. The CEE countries have a sound social climate which scores 107 on average, higher than the Belt and Road average (90). The ASEAN countries have improved their overall social climate through intensified cooperation against terrorism and cross-border crimes. The South Asia, which is the home to many ethnic and racial groups, embraces great cultural diversity. The establishment of regional associations and the signing of free trade agreements have helped lower the barriers for cross-border trade and investment, despite occasional incidents of trade protectionism, breach of contracts and conflicts caused by cultural, religious and racial differences.

Also worth noting are the institutional barriers to overseas infrastructure contractors in some Belt and Road countries where people are put to inconvenience in border crossing and foreigners are required to meet a high threshold or go through a rigmarole to apply for an employment or temporary work visa. For instance, India practices strict control over foreign nationals working within its borders; even managers and engineers will find considerable difficulties in getting an employment visa, let alone normal workers. In some countries, the local staff may even charge compulsory tips when proceeding with the entry/exit formalities, which causes entry/exit inconvenience and a bad effect on overseas infrastructure development.

c) The general financial climate has fluctuated greatly after the 2008 crisis, with the risk of debt insolvency on the rise.

Historical data revealed jagged but generally upward trends in post-2008 financial climate indicators. To be specific, the regional indicators took a sharp turn for the worse in 2009 before climbing back in 2012 and 2016. The slight falls in 2017 were a result of rising sovereign debt insolvency risks.

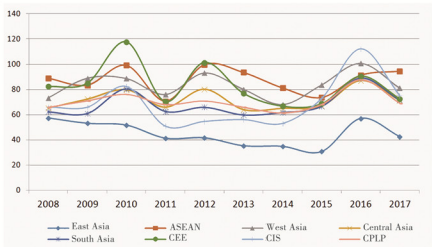


Fig. 3.1: Regional Indicators of Financial Climate[4]

Source: Collected by our research team.

The general financial climate for the Belt and Road infrastructure development took a nasty turn for the worse during the economic crisis, as weighted down by the rising CPIs in 2008, wider average swings in exchange rates in 2009, bigger financial deficits and increased debt insolvency risks. The financial climate began to turn for the better since 2012, thanks to falling CPIs and a significantly larger share of FDIs. But the year 2016 witnessed even fiercer undulations in exchange rates (see Fig. 3.2): many countries such as Moldova hit the 30% mark, while Russian Ruble experienced an almost 60 percent fall against the U.S. currency. Finally, high fiscal expenditures, coupled with a record size of ballooning deficits and appreciable increases in debt insolvency risks, contributed to slight falls in financial climate indicators in 2017.

Harassed by the European Sovereign Debt Crisis, the financial climate worsened in some CEE countries, and began to improve in recent years under the EU support.

In recent years, under influence of financial crisis and the European debt crisis, Portugal seek for the help from European Commission, the European Central Bank and the International Monetary Fund and take stringent measures to reduce the fiscal deficit and structural reform, therefore, financial environment gradually improved.

4 Here, the Central East Asia only includes Mongolia.

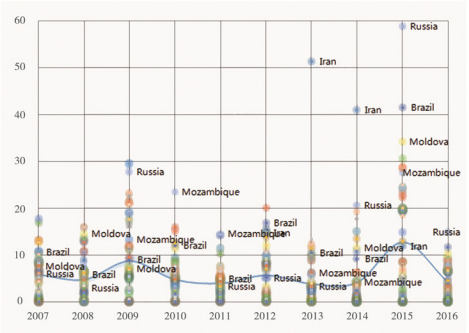


Fig. 3.2: Distribution of Belt and Road Exchange Rate Volatilities

Source: The World Bank, collected by our research team.

d) The general business climate keeps improving, while all countries boast their own edges in the ease of doing business, administrative efficiency and taxation burdens.

A business climate either secures or hinders smooth progress in infrastructure development. According to our calculations, in 2017, the indicator of business climate picked up from the 2016 level, as supported by improved economic laws, increased administrative efficiency and greater ease of payment and settlement among the Belt and Road countries. Now, there have been visible cuts in the time required for paying taxes, contract performance, business registration, and tax costs (see Fig. 3.3).

In terms of administrative efficiency, ASEAN and CPLP countries stand out, where Singapore and Portugal perform well concerning the time required for paying taxes and the time required for business registration. Speaking of the ease of doing business, Russia and Kazakhstan require a shorter time to honor contracts. In addition, Singapore is a step ahead in logistics performance by dint of geological superiority and excellent experiences. As for the burden of taxation, Saudi Arabia and Singapore record the lowest tax rate (% of commercial profits) among all.

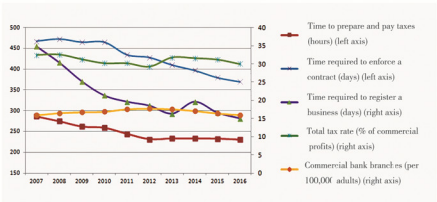


Fig. 3.3: Average Performance of Indicators to Reflect B&R Business Climate

Source: BMI, collected by our research team.

	Russia	Portugal	Singapore	Bulgaria	Pakistan	Saudi Arabia	Kazakhsta
Time to prepare and pay taxes (hours)	168	275	83	424	594	54	188
Time required to register a business (days)	11	2	2	18	19	20	10
Time required to enforce a contract (days)	307	547	150	564	993	575	370
Total tax rate (% of commercial profits)	47	41	18	27	33	15	29
Commercial bank branches (per 100,000 adults)	33	51	9	60	10	9	3
Logistics performance	2.57	3.41	4.14	2.81	2.92	3.16	2.75

The greener the better the country's business environment and performance regarding the specific indicator, the redder the cell, the worse country's business environment and performance regarding the specific indicator.

Fig. 3.4: Business Climate Indicators of Some Countries

Source: The World Bank, collected by our research team.

2. The Belt and Road countries have enormous potentials, as driven by the demands for industrial economic development and the progress of urbanization, so as to meet further requirements on infrastructure facilities for deepened international contacts.

The Development Potential Sub-index has shown a steady upward trend as a whole. The booming demands in ASEAN and CPLP markets form a sharp contrast to the weak needs in Central Asia and West Asia. With abundant factor resources and human capital, the Belt and Road countries are attractive destinations for both domestic and overseas investors and contractors.

Table 3.3: 2017 Top 10 Belt and Road Countries by Development Potential Sub-index

Rank	Country	2017
1	UAE	86
2	Myanmar	76
3	India	74
4	Nepal	73
5	Russia	72
6	Vietnam	72
7	Malaysia	71
8	Brazil	71
9	Indonesia	70
10	Ukraine	69

a) The Belt and Road countries generate booming demands for infrastructure facilities.

Most countries along the Belt and Road belong to the developing world, with rapid economic growth and frequent international economic activities. But they often lag behind in infrastructure facilities with limited per capita ownership, and there has thus arisen a strong demand for infrastructure improvement and upgrading. In addition, along the on-going transfer of international manufacturing industry to some ASEAN and South Asian countries have come an accelerated drive of industrial upgrading and urbanization, and the supply of electricity, transportation and other infrastructure exist a huge gap. The past decade has marked vibrant cross-border economic activities, including investment, trade and tourism, among the Belt and Road countries, and put new demands and requirements on infrastructure development.

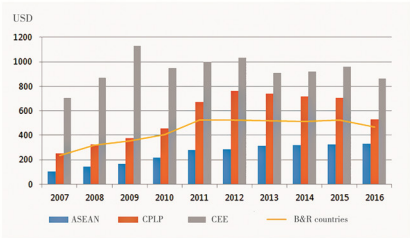


Fig. 3.5 Regional Per Capita Infrastructure Output Value

Source: The World Bank and BMI, collected by our research team.

b) Most Belt and Road countries have advantageous infrastructure resources and abundant manpower.

The factor resources, as a key element that influences the supply, have a direct bearing on infrastructure construction costs. Rich in natural resources (e.g. iron and copper ores) and human resources, the Belt and Road countries have a unique edge in developing infrastructure facilities. In terms of factor resources, the Belt and Road countries boast an adequate supply of steels, cements and other construction materials. To be specific, Vietnam is the world's No.5 cement producer and India is the 4th biggest steel producing country; they both have enough construction materials to satisfy domestic demands. Besides, a sufficient supply of low-cost manpower is also a prerequisite for rapid infrastructure development. In 2015, the average monthly salary recorded USD 282 in Indonesia and USD 207 in Cambodia, far below the global average of USD 1,480.[5]

c) The Belt and Road countries vary significantly in development potential.

The Belt and Road countries vary greatly in development potential as a result of varying demands for infrastructure facilities and the remarkable gap in the availability of factor resources (see Fig. 3.6). According to the development potential indicators, some ASEAN and South Asian countries, including Vietnam, Indonesia, India and Malaysia, underwent fast economic growth in 2017. Given their advantageous factor resources, these countries will have strong and enormous development potentials in the future, forming a stark contrast to their neighbors in the West Asia and Central Asia where sluggish economic growth and a severe shortage of factor resources have impeded their infrastructure development.

5 International Labour Organization (ILO), Global Wage Report 2014/15, www.ilo.org

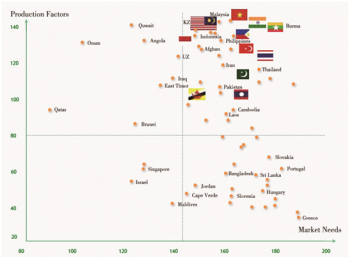


Fig. 3.6: Distribution of B&R Countries by Market Needs and Production Factors

3. Infrastructure registers a spiral growth, with Indonesia, India, Vietnam and Iran as both growth leaders and hotspots for cross-border projects.

Generally, the belt and road countries have seen a spiral growth in infrastructure. Their enthusiasm for cross-border projects over the past two years indicates an optimistic industry outlook on the whole. The above-mentioned four countries stay ahead of the growth curve, while Pakistan emerges as both a hotspot for cross-border projects and a potential growth engine.

a) Gross infrastructure output records a spiral growth, driven by a sharp growth in the value of new contracts on cross-border projects over the past two years.

The growth of infrastructure output in B&R countries has shrunk slightly over the past two years. With oil, among other bulk resource commodities, at low price levels, some resource-exporting countries fail to underwrite the constant infrastructure expansion and thus suffer a considerable decline in infrastructure output. In 2015, that of Russia, for instance, dropped nearly 27% from the previous year.

By contrast, ASEAN members manage to maintain the sound momentum. Indonesia comes out top among the leading countries in infrastructure output with a 10.4% growth in 2016.

From 2015 onwards, cross-border project contractors and investors have made a more ambitious foray into B&R markets. As a result, new contracts on such projects grew significantly in both quantity and value that year; on the value side, Iran, Serbia, Egypt and Israel were the greatest contributors to the 150% increase from 2014. The quantity and value of new contracts remained high in 2016, despite some decline from 2015.

b) Pakistan, Sri Lanka, Bulgaria and Armenia are obviously warming to cross-border projects.

The annual growth in infrastructure output reflects the speed and consistency of infrastructure development, while the value of new contracts on cross-border projects mirrors the warm of infrastructure development. By these two indicators, infrastructures of B&R countries are at quite different levels of development (see Fig. 3.8).

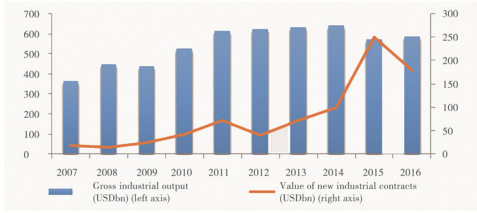


Fig. 3.7:Gross Infrastructure Output and Value of New Contracts on Cross-border Projects in B&R Countries
Source: BMI, collected by our research team.

Indonesia, India, Vietnam and Iran stand out in both speed and warm of infrastructure development. They will remain on the fast track, as their investment environment and growth potential are well accepted by cross-border project contractors and investors. The same is with Pakistan, Sri Lanka, Bulgaria and Armenia, only that their embryonic infrastructure industries are keen on expansion to match speed with large momentum. The latter four deserve close attention of the contractors and investors.

The pace of infrastructure development in Brazil is at a high level, but due to the recent deterioration in the financial climate, the cross-border projects are at a low level. In Portugal, Angola and other Portuguese-speaking countries, the pace of development of infrastructure and cross-border projects are at a moderate level, their infrastructure construction are progressing steadily.

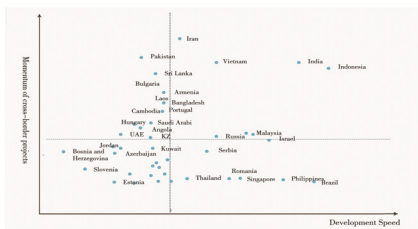


Fig. 3.8: Distribution of B&R Countries by Infrastructure Development
Source: BMI, collected by our research team.

IV. Analysis on Infrastructure Industries of B&R Countries

The Index shows a stable growth in infrastructure in B&R countries across the board, yet the conditions of various industries are not exactly the same. Transportation is, and will be, in the uptrend, thanks to robust construction demands and clearly specified medium-to-long-term plans; the building industry features high output, steady development, and great potential for residential housing; the energy industry focuses on electricity and renewable and nuclear energy are gaining attention; utilities represent only a minor share of output; and telecommunications are attractive to cross-border investors.

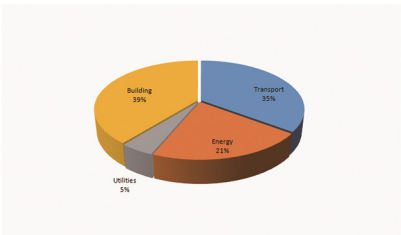


Fig. 4.1: Proportion of Output by Infrastructure Industries in B&R Countries

Source: BMI (data processed by the Research Team)

1. Transportation: prominent demand, promising future

In 2007–2016, B&R countries logged a 64.5% growth in the gross output of transportation projects (see Fig. 4.2). However, in terms of output per capita, they fall far short of the global average (USD 61 vs. USD 97.3 in 2016).

Most B&R countries see transportation infrastructure construction as an important means to shape the spatial economy. Therefore, transportation development, from the upgrading and transformation of roads and railways to the construction of expressway and railway networks, figures prominently in their medium-to-long-term plans. The transportation development plans of Brazil, Poland, Kazakhstan, Indonesia and India are typical.

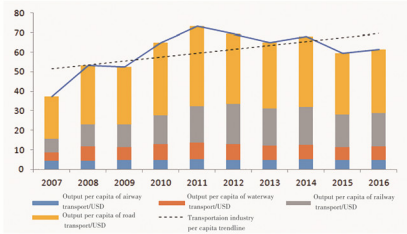


Fig. 4.2: Output per Capita of Transportation Sectors in B&R Countries

Source: World Bank and BMI (data processed by the Research Team)

Table 4.1: Transportation Development Plans of Some Countries

Country	Category	Development Plan
Brazil	Road	Invest 66.1 billion Brazillian Reals in the newly-building of 7,919km roads and maintenance of 55,000km roads
	Railway	Invest 86.4 billion Brazillian Reals in the construction of 4,696km railways and feasibility study of 3 high-speed railways
	Water	Develop ports and dorks with a total investment of 374 billion Brazillian Reals
	Air	Invest 3 billion Brazillian Reals in the construction of Fortaleza, Salvatore and other airports
Poland	Road	Build a 7,200km expressway and highway network by 2020.
	Railway	1.Connect 12 large cities with railways which support 160km/h operation by 2020. 2. Modernize the Central Railway Station Warsaw, Gdynia Station and Wrocław Station; build the Warsaw West Station, Warsaw East Station and Katowice Station.
	Air	Build terminals, transform airfields, and modernize airstrips and taxiways.

Country	Category	Development Plan
Kazakhstan	Road	Connect various parts of the country with trunk roads, including 16,000km world-class highways, by 2020.
	Railway	1. Build 1,400km railways by 2020. 2. Cut the proportion of over-aged railways, trains and facilities concerned to 40%; ensure freight trains run at no less than 55km/h.
Indonesia	Road	Build 2,650km highways and 1,000km expressways;repair the existing roads of 46,770km in 2015–2019.
	Railway	Build a 3,258km railway network in 2015–2019.
	Water	Build 24 large ports in 2015–2019.
	Air	Build 15 airports by 2019.
India	Road	Invest an additional USD 1 trillion in road construction; upgrade and transform national and state roads.
	Railway	1. Uplift the current average train speed of 130km/h to 160–200km/h by 2020 2. Modernize 22 major stations across the country. 3. Build 25,000km railways by 2020.
	Air	1. Build a new airport in Mumbai and the Goa International Airport. 2. Build eight airports in tier-2 and tier-3 cities; upgrade and transform 21 airports.

Source: Overseas Investment Cooperation Country Guide by MOFCOM (data processed by the Research Team)

2. Building: targeting housing upgradation in residential field

In recent years, the belt and road countries have witnessed steady development of building industries. The gross industrial output continues in the uptrend, although its growth shrinks slightly over the past two years. Generally, the countries will present strong demands for industrial buildings and indemnificatory housing in the coming years.

Building companies of some countries lack qualifications and have trouble getting funded. Their indemnificatory housing sectors are hungry for external capital and technology. With a large population of potential upgraders, Indonesia, Vietnam, Kazakhstan and Myanmar have adopted liberal policies towards building. These countries deserve close attention of international investors and contractors.

Table 4.2: Building Development Plans of Some Countries

Country	Category	Development plan
Russia	Building	1. Build homes of 25 million m2 in 36 quarters by 2017. 2. Invest RUB 86.78 billion in building and improving homes in、St. Petersburg. 3. Allocate RUB 7.44 trillion for domestic housing construction by the end of 2019.
Kazakhstan	Building	1. Build indemnificatory housing of over 8 million m2 by 2020. 2. Vigorously develop non-home infrastructure to shore up the f altering economy.
Indonesia	Building	1. Build 5,257 double-roof apartment buildings in 2015–2019. 2. Develop 13 industrial parks.
Myanmar	Building	Build 1 million apartments in 2013–2028.
Saudi Arabia	Building	Build 1 million apartments in 2013–2028.

Source: Overseas Investment Cooperation Country Guide by MOFCOM (data processed by the Research Team)

3. Energy: stable output growth, focus on electricity

Most B&R countries have registered steady development of energy industries (see Fig. 4.3). India's energy output will climb even higher. Owing to the EU-US economic sanctions, Russia's energy growth declined somewhat from a high level in 2004, but the 2016 stats herald stable output growth in the future. Output growth also tends to level off in the likes of Indonesia, Turkey and Qatar.

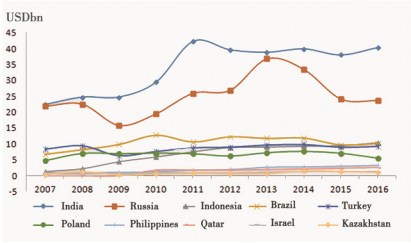


Fig. 4.3: Ten-year Growth Trajectory of Energy Industries in Some Countries

Source: BMI (data processed by the Research Team)

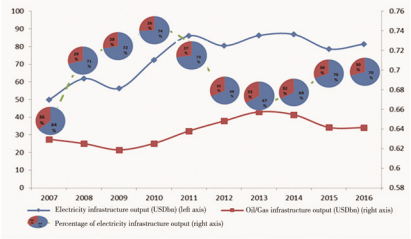


Fig. 4.4: Comparison between the Output of Electricity and Oil/Gas Infrastructures in B&R Countries

Source: BMI (data processed by the Research Team)

Electricity and sustainability are the keywords of energy development plans of B&R countries. Seeing electricity shortage as a constraint on stable economic growth, the countries, mostly in the third world camp, place great emphasis on electricity infrastructure. Stats show the marked uptrend in electricity output, whose share of energy output climbed from 67% in 2013 to 70% in 2016 (see Fig. 4.4). Given the sluggish oil and gas markets, the proportion of electricity output is projected to keep rising.

Furthermore, as the ideology of sustainable development is well received, renewable and nuclear electricity projects will go down better in B&R countries.

Table 4.3: Energy Development Plans of Some Countries

Country	Category	Development plan
Iran	Electricity	1. Build nine nuclear power plants by 2025. 2. Invest USD 50 billion in building 800 energy projects in 20 years.
	Renewable energy	1. Increase wind and solar power capacity by 5,000mw, and generate solar electricity of no less than 500mw by 2018. 2. Build the inaugural 50mw geothermal power plant.
Vietnam	Electricity	Give priority to hydropower; increase hydropower capacity to 21,600mw by 2020 and 24,600mw by 2025.
	Renewable energy	1. Increase wind power capacity to approx. 800mw by 2020, 2,000mw by 2025 and 6,000mw by 2030. 2. Increase solar power capacity to 800mw by 2020, 4,000mw by 2025 and approx. 12,000mw by 2030.
Saudi Arabia	Nuclear power	Invest some USD 100 billion in building 16 nuclear power plants by 2030, with a total capacity of 22,000mw.
Pakistan	Electricity	1. Rev up construction of medium-to-large-sized hydropower plants, striving to increase hydropower capacity to 32,660mw by 2030. 2. Develop thermal power plants and the Thar Coalfield with coal reserves of 180 billion tons
	Oil and gas	Increase recoverable reserves from the current level of 840 million barrels (or 51.5 billion cubic feet) to 27 billion barrels (282 billion cubic feet).
	Nuclear power	Installed capacity: 8,800mw.
	Renewable energy	Installed capacity: 9,700mw.

Source: Overseas Investment Cooperation Country Guide by MOFCOM (data processed by the Research Team)

4. Utilities: more liberal policies and rosy prospects for telecommunications

The Belt and Road countries record steady development of utilities industries. New cross-border projects in this regard focus mainly on sewage treatment and telecommunications network.

A pillar industry, telecommunications used to keep foreign investors at bay with high entry barriers and complicated application procedures. Poland, Myanmar, Bangladesh, India and Malaysia imposed a strict ban on foreign investment in telecommunications services. Cambodia stopped issuing telecommunications operator licenses in 2012. Russia,Indonesia and Ethiopia denied foreign investors entry into telecommunications markets, ordering that base stations must be built and operated by wholly domestically funded companies. Today, however, most B&R countries are liberalizing their policies and markets, delivering telecommunications services into private hands and drawing foreign capital into infrastructure construction (see Tab4.4).

Table 4.4: Utilities Development Plans of Some Countries

Country	Category	Development plan
Kazakhstan	Telecommunications	1. Build modern optical fiber and wireless communication infrastructure, and increase computer penetration rate to 60% by 2020. 2. Modernize the 24,400km network.
Poland	Telecommunications	Develop telecommunications network, boost demand for high-traffic services, and build a broadband network covering the whole country in 2014-2020.
Indonesia	Telecommunications	1. Build clean water supply systems in towns 2. Build sewage treatment facilities in 227 cities, counties and special regions; provide sewage treatment services for 430 cities, counties and special regions.
	Water supply	1. Build clean water supply systems in towns. 2. Build sewage treatment facilities in 227 cities, counties and special regions; provide sewage treatment services for 430 cities, counties and special regions.
Malaysia	Telecommunications	1. Develop the second-generation high-speed broadband network with a speed up to 100m/s; 2. Add 420,000 broadband network interfaces to suburbs and villages across the country; ensure that 50% of the suburbs and villages enjoy an Internet connection speed up to 20m/s by 2020.

Source: Overseas Investment Cooperation Country Guide by MOFCOM (data processed by the Research Team)

V. Conclusion and Suggestion

The B&R initiative offers new approaches to deepen bi-/multi-lateral cooperation and promote regional development. On the infrastructure front, the smooth cooperation among B&R countries is accompanied by multi-faceted threats. Cross-border project contractors and investors are suggested to do business in line with the realities of the host country, and marry business growth with regional infrastructure development.

1. Opportunities

The B&R initiative brings policy dividends to, and coordinates infrastructure development of, countries along the routes. Among them, Pakistan and Sri Lanka stand to be new growth poles. B&R countries are facing new opportunities, as the ideology of sustainable development finds its way into the infrastructure industry.

a) The belt and road is turning from a Chinese initiative to a global endeavor, bringing policy dividends and promoting factor mobility.

On the Belt and Road International Cooperation Forum held in May 2017, Chinese promised to increase financial support for the B&R constructions, with additional funds of 100 billion yuan to the Silk Road Fund. China also encouraged financial institutions to carry out overseas RMB funds which are approximately in a scale of 300 billionyuan.China Development Bank and Export-Import Bankof China would provide 250 billion yuan and 130 billion yuan RMB equivalent special loans to support B&R infrastructure construction, production capacity cooperation and financial cooperation. Meanwhile, the infrastructure projects will receive stronger support from World Bank, Asian Development Bank, the New BRICs Development Bank and Asian Infrastructure Investment Bank, among other multilateral financial institutions and development banks.

More and more countries are voluntarily aligning their strategic development plans[6] with the B&R initiative so as to draw on one another's competitive advantages. The initiative has better prepared B&R countries for the mobility of production factors, promoted the integration and development of human resources across the region, and boosted factor and technology transfer[7] between high-caliber labor forces for the purpose of infrastructure construction.

b) Pakistan, Sri Lanka and Bangladesh promise to emerge as new infrastructure hotspots.

In recent years, there has been no shortage of fireworks in the infrastructure industries of Pakistan, Sri Lanka and Bangladesh. These countries have made clear and detailed plans for electricity, transportation, telecommunications and other key indus-

6. Including Russia's Eurasian Economic Union, Mongolia's "Steppe Road" Program, Kazakhstan's "Nurly Zhol" (bright path), Europe's Juncker Plan, Vietnam's "Two Corridors and One Circle", Australia's "Vision for Developing North Australia", and Saudi Arabia's "Vision 2030".

7. China exports bridging, communication, and high-speed railway construction technology to Central Asia, West Asia and South Asia; India exports IT and hi-tech labor forces to Gulf States.

tries, aiming to ramp up infrastructure investment through BOT and PPP. They rely heavily on infrastructure to maintain their 6% economic growth. The sheer value of new contracts on cross-border projects speaks of how contractors and investors are attracted to the investment environment and growth potential of these countries. Dwarfed as they are by Indonesia in the speed of infrastructure development, Pakistan, Sri Lanka and Bangladesh are tipped to be new infrastructure hotspots.

c) The ideology of sustainable development dictates the future of infrastructure.

The adoption of the Paris Agreement on Dec. 12th, 2015 and the official launch of the 2030 Agenda for Sustainable Development on Jan. 1st, 2016 have ushered in the final spurt towards clean, green, low-carbon energy. Developing "sustainable" infrastructure, which is cost-effective, environment-friendly, conducive to social harmony, and easy to operate, is turning out to be a global endeavor. B&R countries, in particular, will work together on the connectivity of new energy infrastructures (e.g. wind and solar power plants). They will also stress the reconciliation of infrastructure planning, investment, construction and operation with environmental protection, hoping the projects will grow together with the communities on their doorstep.

2. Risks

The world economy is shuffling out of the mire of financial crisis into a period of profound adjustment. The revival of protectionism on trade and investment, together with terrorism, regional conflicts and refugee issues, among other political and security threats, has brought many uncertainties to B&R projects.

a) Geopolitical risks pose a threat to cross-border projects.

Geopolitical complexity looms large for B&R countries trapped in the maze of social tension, class struggle, ethnic conflicts, religious issues, and warfare. Competing economic and political interests involved, there has been no sign of détente since 2015. The worsening structural imbalances and endless partisan brawl point to grave political uncertainties in the Middle East. Terrorism, extremism, nationalism and religionism run amok in Central and West Asia, a region long beset by refugee issues and local disputes. The ongoing political transition in Southeast Asia is sowing the seeds of populism and ethnic conflicts; the clash of ideologies and the interventions of external forces pose dire challenges to policy consistency and stability of countries concerned.

b) Protectionism raises barriers to contractors and investors.

Varied in development level, religious belief, culture and tradition, B&R countries have long been lacking in mutual trust and the capability of resource integration. Moreover, amid the prolonged global economic recession in recent years, anti-globalization sentiments are simmering, and protectionism rearing its head in the countries. As the formation of exclusive trade blocs leads to a fragmented world, a grab bag of non-market factors (cultural, political etc.) exasperate the impact of protectionism on bi-/multi-lateral trade.

c) Sovereign risks may nibble away at profits.

High costs, long periods and uncertainties sum up infrastructure projects in B&R countries. In a weak fiscal position, some of the countries have run up large current account deficits and debts even before the investment influx. Inadequate foreign exchange reserves and flimsy solvency margin simply add to their vulnerability to sovereign debt crises. Foreign stakeholders cannot help worrying about capital turnover and schedule, since the project funds are as prone to delay as they are susceptible to exchange control and massive currency depreciation.

3. Suggestions

Based on BRIDI's performance and our analyses on infrastructure development opportunities and risks, the following suggestions are made for cross-border project contractors, investors as well as governments and financial institutions of various countries:

a) Contractors and investors should further strengthen market research, policy communication and risk control.

The B&R construction covers a number of international regions and countries, which are diametrically different from one another in history, culture, political system, economic level and international influence. Contractors and investors should deepen research on the host country-especially from an infrastructure development perspective based on national realities and their own strengths. They should pay close attention to government policies in support of the B&R initiative, covering the building of international infrastructure network, synergies in infrastructure planning and construction, and favorable environment for private investment. Furthermore, they should look for market opportunities with an eye on, and solutions to, the intrinsic risks.

b) Contractors and investors should seek extensive cooperation and enhance the success rate of projects.

For contractors and investors, cooperate with companies along the industry chain, local businesses and specialized service providers is helpful not only to avoid investment and trade barriers and prevent political and social risks, but also to tap deeper into the markets and build competitiveness. To improve their chances of success, they may hash out cooperation and sharing mechanisms, making an inroad into the target markets in the name of consortiums or joint ventures.

c) Contractors and investors should focus on cultural, economic and social integration and build sustainable infrastructure projects.

Project sustainability has four dimensions: economy, society, environment and governance. Contractors and investors should heed the actualities of the host country and the needs of locals, implement the ideology of green development, and perform CSR. They should also respect local culture and folk customs, press ahead with localization, and be more ready to serve the communities on their doorstep.

d) Governments should enhance communications and build platforms for contractors and investors.

As governments are the planners and bellwethers of B&R infrastructure construction, inter-governmental policy coordination is crucial to the B&R infrastructure cooperation environment. Governments should pitch in to align their infrastructure development plans with the B&R initiative for the sake of complementary advantages and strategic synergies. A multi-tiered inter-governmental macro-economy coordination mechanism will provide combined impetus for major connectivity projects. Furthermore, governments should lower the infra-

structure market threshold to facilitate win-win international cooperation.

e) Financial institutions should jointly and innovatively support cross-border infrastructure construction.

The financial crisis casts a long shadow on infrastructure. As traditional financing no longer helps, innovative moves are in urgent need. Financial institutions of all countries should jointly expand bilateral local currency swap to reduce the transaction costs of multinationals. Development banks should play an active role and strengthen cooperation with other multilateral finance institutions. Payment system cooperation and inclusive finance are expected to promote the opening-up and connectivity of financial markets. And private capital deserves a greater role in international infrastructure construction and operation.

Appendix I: B&R Infrastructure Development Gross

Country	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Gross index	100	102	121	105	101	118	119	110	136	117

Appendix II: B&R Infrastructure Development Index: Along-the-route Country Rankings

Country	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Indonesia	171	142	173	187	202	243	195	198	220	195
Iran	147	129	172	103	159	152	131	94	145	171
India	202	158	135	149	135	163	140	134	152	170
Vietnam	108	135	153	156	133	180	183	159	225	146
Singapore	118	142	164	136	129	149	149	141	161	145
Russia	154	135	139	148	134	139	148	125	132	144
Pakistan	96	90	116	102	98	121	114	126	161	139
Bulgaria	87	96	135	96	97	116	140	106	134	136
Malaysia	116	99	128	117	130	129	131	124	155	135
Israel	102	110	133	106	117	129	141	122	160	133
Saudi Arabia	116	110	134	120	106	142	129	119	148	129
Kuwait	95	102	124	98	100	116	117	113	160	127
UAE	110	128	162	112	112	118	125	114	143	126
Qatar	93	106	121	92	127	126	125	117	141	125
Sri Lanka	90	74	112	82	82	112	104	103	131	124
Philippines	120	95	122	107	99	133	149	115	141	124
Czech	122	113	123	110	131	118	117	114	150	123
Hungary	90	98	120	98	97	109	113	101	129	123
Armenia	70	76	106	78	75	101	99	111	126	123
Thailand	100	95	113	111	105	153	125	112	143	120
Cambodia	84	97	153	92	106	136	132	109	126	120
Turkey	130	110	118	125	107	124	126	120	136	120
Serbia	78	110	118	100	109	115	112	106	118	119
Romania	104	114	135	98	99	113	127	118	130	118
Poland	**118**	**134**	**135**	**116**	**117**	**119**	**137**	**123**	**141**	**117**
Laos	88	77	105	84	76	109	100	93	120	117
Kazakhstan	90	97	98	96	91	115	113	106	134	115
Bangladesh	79	78	98	104	80	106	101	89	126	115
Croatia	108	94	122	100	99	127	114	102	140	115
Bahrain	89	370	176	97	128	111	117	118	157	114
Cyprus	87	98	116	96	126	115	112	107	129	114
Myanmar	84	87	111	96	92	113	111	102	123	113
Georgia	77	80	116	81	82	124	104	104	131	112
Slovakia	93	101	114	88	97	109	109	101	126	111
Nepal	81	84	107	90	89	106	109	98	126	111
Mongolia	81	86	106	94	85	112	109	98	127	111

Country	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Azerbaijan	85	88	113	99	92	112	116	104	132	110
Moldova	81	79	101	84	81	100	105	93	119	110
Egypt	95	87	126	108	86	115	106	111	141	110
Brunei	75	90	104	92	89	106	110	96	124	109
Montenegro	81	83	111	86	98	105	107	98	125	109
Greece	105	99	116	95	109	107	108	94	119	109
Latvia	81	85	123	82	86	99	106	92	119	108
Macedonia	80	85	109	86	91	116	108	109	132	107
Uzbekistan	88	113	141	111	99	105	113	123	129	107
Lithuania	90	87	94	86	87	106	104	97	119	107
Slovenia	87	99	114	88	98	105	112	107	128	106
Bosnia and Herzegovina	79	86	105	95	91	106	109	99	121	106
Albania	106	111	111	86	94	98	104	92	122	104
Maldives	74	81	102	81	82	98	106	97	126	104
Ukraine	90	101	98	91	81	106	103	84	119	104
Tajikistan	83	83	142	82	94	108	109	126	169	103
Kyrgyzstan	80	78	100	79	81	103	108	98	125	103
Turkmenistan	77	85	105	89	83	101	104	101	127	103
Lebanon	83	102	109	92	105	111	118	107	128	102
Jordan	316	81	107	305	91	104	133	103	125	101
Estonia	104	85	98	110	87	123	106	96	121	101
Iraq	67	71	103	89	87	116	123	107	133	101
Bhutan	74	88	105	83	82	100	100	92	120	100
Yemen	79	78	99	82	79	96	102	88	119	100
Oman	92	88	141	100	98	129	118	108	134	99

Country	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Belarus	99	81	99	93	71	83	107	92	99	98
Afghanistan	74	75	100	84	80	99	104	89	117	94

Appendix III: B&R Infrastructure Development Index: Portuguese-speaking Country

Country	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Brazil	171	154	188	229	200	204	205	176	153	168
Portugal	115	147	130	111	122	126	126	113	156	144
Angola	117	136	142	102	88	111	109	114	162	105
Mozambique	76	81	122	84	83	103	105	100	132	104
Sao Tome and Principe	76	86	104	107	85	100	105	117	126	102
Cape Verde	68	74	96	79	78	96	100	86	115	100
East Timor	78	83	104	125	82	94	101	139	128	96
Guinea-Bissau	73	69	89	83	70	90	96	86	111	91

Appendix IV: Development Climate Rankings (Top 15)

Country	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Singapore	156	166	167	163	169	165	164	165	169	166
Portugal	162	190	143	136	158	139	134	130	132	133
Russia	165	135	148	147	146	143	146	130	121	126
Brazil	153	146	146	161	154	141	139	130	117	120
Kuwait	99	99	105	96	104	100	97	108	149	119
Israel	117	127	148	117	138	118	119	114	120	115
Poland	132	143	137	120	126	118	121	113	120	115
Croatia	153	121	135	113	130	115	112	111	115	113

Country	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Bulgaria	115	112	158	109	118	133	111	109	115	113
Cyprus	113	118	112	113	162	122	114	111	115	113
Turkey	116	108	109	106	108	101	105	105	108	107
Hungary	119	124	125	113	122	109	112	106	109	107
Saudi Arabia	102	107	109	109	108	118	108	109	125	107
Slovenia	114	114	114	109	121	112	109	104	110	105
Czech	157	114	116	108	123	109	108	104	108	105

Appendix V: Development Potential Rankings (Top 15)

Country	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
UAE	86	85	86	84	80	75	77	78	73	86
Myanmar	59	59	60	63	62	63	70	70	59	76
India	61	60	65	63	63	63	66	70	62	74
Nepal	60	59	63	63	63	63	66	67	62	73
Russia	54	52	60	54	55	56	60	55	54	72
Vietnam	59	58	60	61	61	61	65	67	60	72
Malaysia	58	57	59	59	60	60	63	65	59	71
Brazil	55	54	58	57	56	56	59	60	55	71
Indonesia	57	56	62	59	60	59	63	64	58	70
Ukraine	55	54	53	53	54	55	58	53	56	69
Yemen	56	57	57	56	57	56	60	56	56	69
Azerbaijan	55	59	59	59	60	61	64	67	58	69
Mongolia	57	57	60	60	61	61	64	66	61	69
Philippines	57	57	58	59	60	60	66	67	59	68
Turkey	55	53	61	56	57	59	60	65	57	68

Appendix VI: Development Trend Rankings (Top 15)

Country	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Indonesia	187	131	185	228	237	332	236	240	289	224
Iran	152	122	205	65	171	177	171	112	173	200
India	239	149	102	133	104	165	115	103	136	165
Brazil	135	107	171	241	191	211	213	162	135	145
Vietnam	70	126	167	179	135	216	212	164	303	132
Pakistan	39	41	91	62	56	107	84	104	146	124
Sri Lanka	55	30	78	37	34	94	75	69	131	107
Israel	52	57	81	56	56	101	119	86	160	105
Bulgaria	24	42	74	47	40	63	130	62	118	101
Armenia	22	29	72	36	32	77	72	45	111	100
Philippines	62	48	99	76	55	128	102	87	137	99
Qatar	27	53	77	59	88	95	94	67	122	98
Laos	45	31	80	42	31	91	75	52	107	97
Malaysia	68	34	92	75	47	98	100	75	137	96
Bangladesh	30	29	72	85	36	90	75	48	123	95

Appendix VII: Index Calculation Methodology

The analytic hierarchy process (AHP) is used to mathematize the decision-making process based on limited qualitative information.

The Index is prepared in five steps, namely "missing data handling", "data standardization", "weight setting", "index calculation", and "index

Step One: Data processing

Data from different sources are often calculated by different methods, and some data required for Index preparation are false or unavailable. The Index verification techniques mainly include subjective judgment, outlier detection, and trend detection. To fill in data gaps, multivariate imputation by chained equations, as well as cluster analysis, linear regression analysis, neighboring mean value analy-

sis, correlation analysis and moving average method, are adopted. To uplift the overall quality and robustness of data, the opaque data penalty factor is added to items where data are severely lacking.

Step Two: Data standardization

To ensure the comparability and uniformity of data in various items, the ten-year data of B&R countries are standardized in three steps. Let i represent the B&R country (i = 1, 2…71), and j the year (j = 2007, 2008…2016).

(1) Nondimensionalization: to eliminate the differences in data unit and order of magnitude.

$$Y_{i,j} = 100 \times \frac{X_{i,j}}{X_{07}}$$

X(i,j) means the data of Country No.i in Year j; X07 means the expected value of a specific indicator of all countries concerned in 2007; Y(i,j) means the nondimensionalized data of Country No.i in Year j.

(2) Homogenization of reverse and moderate indicators.

(3) Uniformization: to ensure the data fall within the target range.

$$Y_{i,j} = \frac{X_{i,j} - X_{min,j}}{X_{max,j} - X_{min,j}} \times 100.$$

X(i,j)means the data of Country No.iin Year j; X (max,j) means the maximum value of all countries concerned in Year j; X(min,j) means the mininum value of all countries concerned in Year j; Y(i,j) means the uniformized data of Country No.iin Year j.

Step Three: Weight setting

As the determinants of infrastructure construction and the contributions to regional development vary from country to country, AHP, a qualitative and quantitative approach, is employed to determine the weights of indicators at each tier and the importance rankings of various countries. Regarding the three-tiered structural model of the Index, Dagong Global and CHINCA organize several rounds of expert review, and mathematically compare the importance of each tier and indicators concerned in a pairwise manner until w_ α , the importance weight for all indicators at each tier, is figured out. Finally, the combined importance weight for the three tiers is calculated as the basis for evaluation.

Step Four: Index calculation

Multiply Y(i,j)by w_ α , and we get the sub-indices of each country each year.

$$Z_{i,j} = w_{\alpha} \times Y_{i,j}$$

The gross index is a combination of sub-indices. It manifests the overall conditions of infrastructure construction in each country each year alongside the ten-year trajectory.

Step Five: Index verification

As the Index thus calculated is likely to be counter-intuitive or illogical, we need to examine whether the structural model is excessively or insufficiently fit and, based on expert comments, verify the index before adjusting specific parameters.

“一带一路”国家基础设施发展指数报告

The Belt and Road Infrastructure Development Index Report

中国对外承包工程商会
China International Contractors Association
TEL：+86-10-59765284
FAX：+86-10-59765204
E-mail：consulting@chinca.org

大公信用信息服务有限公司
Dagong Credit Information
TEL：+86-10-51087768
FAX：+86-10-84583355
E-mail：Dagongci@dagongcredit.com