

# わが国における 社会資本の現状と評価

～ 社会資本の国勢調査・健康診断～

2007年9月13日

(社)土木学会 会長  
石井 弓夫

出典：国土地理院1/2.5万地形図「桜井」「畝久山」を編集



# 利根川の東遷



江戸時代



現在





# 社会資本の分類

## ■ 基本的な社会資本

- 水（河川、上下水道、海岸など）
- 交通（道路、鉄道、空港、港湾など）
- 都市（土地利用、街路、地下空間など）
- エネルギー（火力、原子力、水力、新エネルギーなど）

## ■ 横断的な社会資本

- 環境（生態系、水質、大気、地球温暖化など）
- 情報（運用・維持・点検システム）
- 防災（ハザードマップ、予・警報、災害保険など）

## ■ 事業執行システム



# 戦前から活きている遺産

- 交通
  - 鉄道、一般道路
- エネルギー
  - 水路式発電
- 水(河川)
  - 治水、港湾・航路
- 「植民地土木」



琵琶湖疏水 蹴上発電所

出典:京都市上下水道局HP



# 戦災復興、災害復旧

## ■ ダム

- 上水道
- かんがい
- 発電
- 治水

小河内ダム  
石渕ダム  
佐久間ダム  
五十里ダム

## ■ 道路網整備

- 道路整備五ヵ年計画

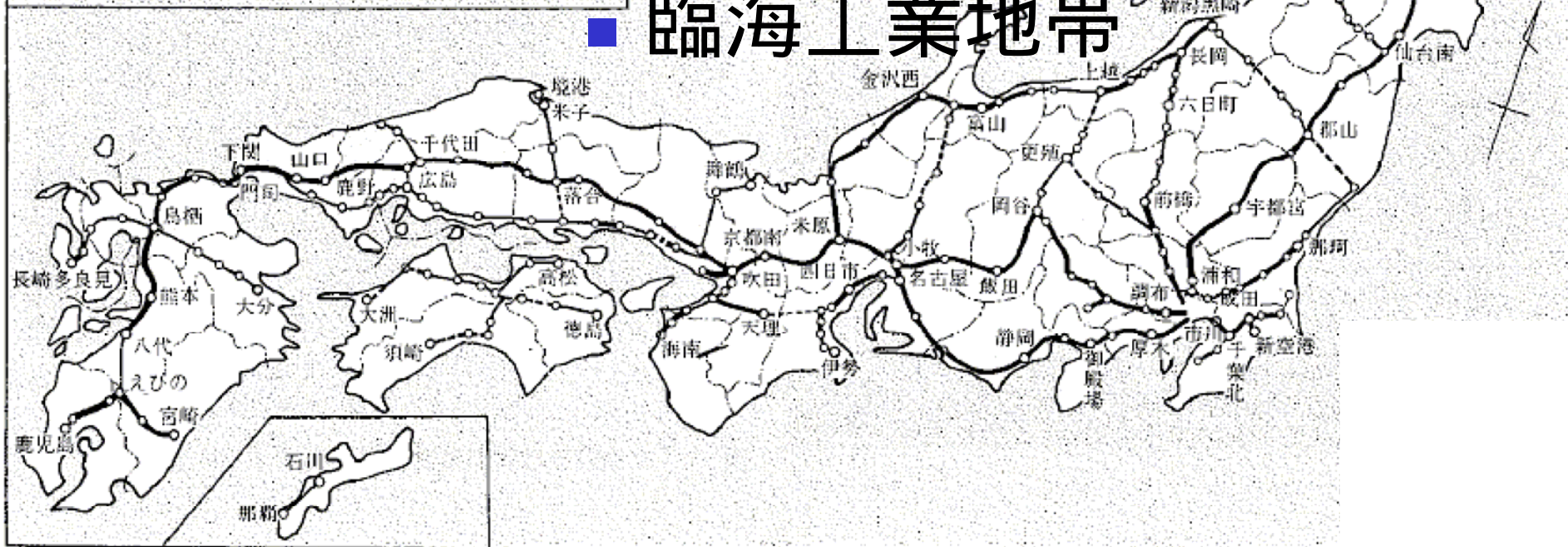


小河内ダム

出典：日本水道新聞社発行「近代水道百選」



- 
- 高
- 稚内  
名寄  
旭川南  
北見  
池田  
釧路  
清水  
苫小牧西  
小樽  
西館





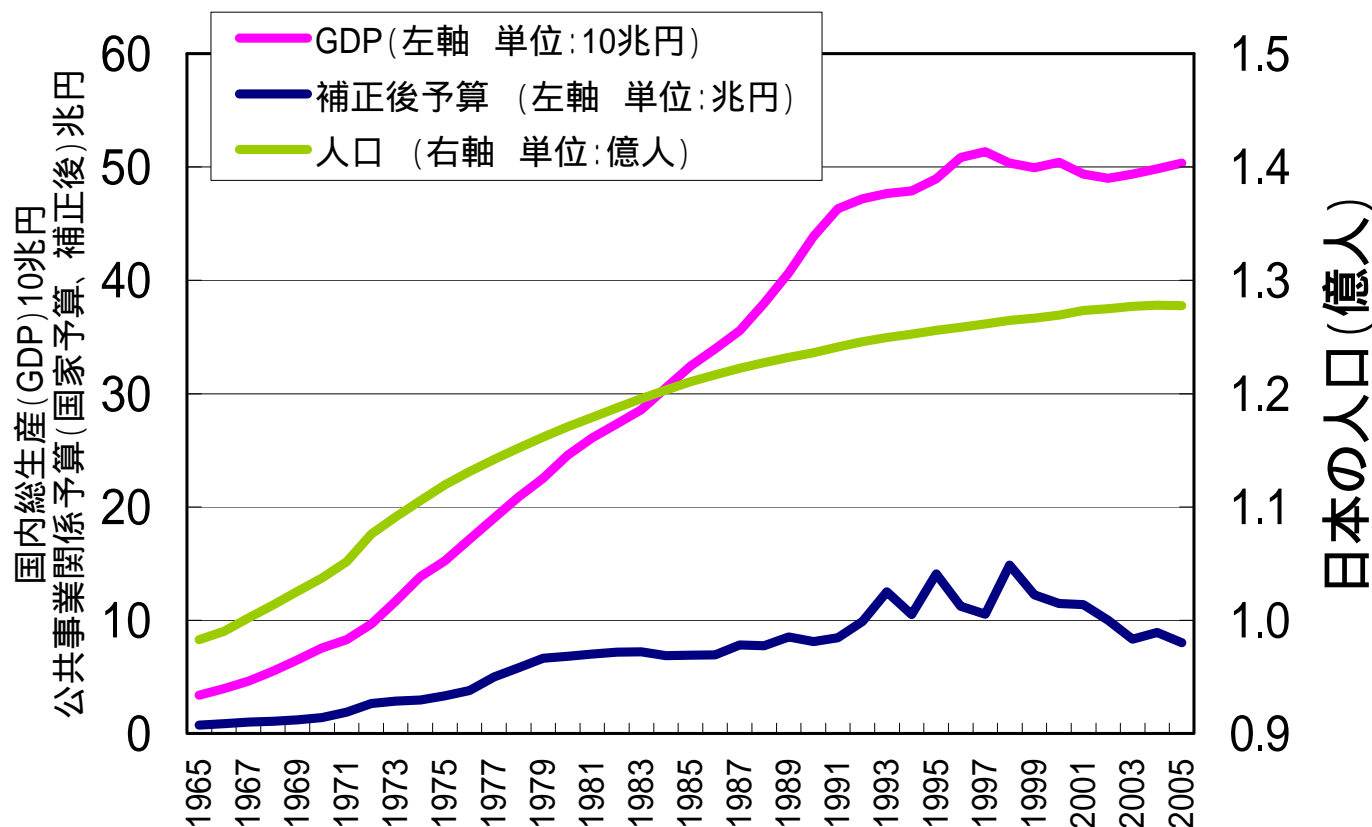
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# 高度経済成長から安定成長へ

- 環境破壊
- 公害病
- 第一次オイルショック
- 社会資本投資は1998年がピーク



# GDP・人口・社会資本投資の変遷



出典: GDP 内閣府国民経済計算確報

人口 日本統計年鑑

公共事業関係予算(補正後)

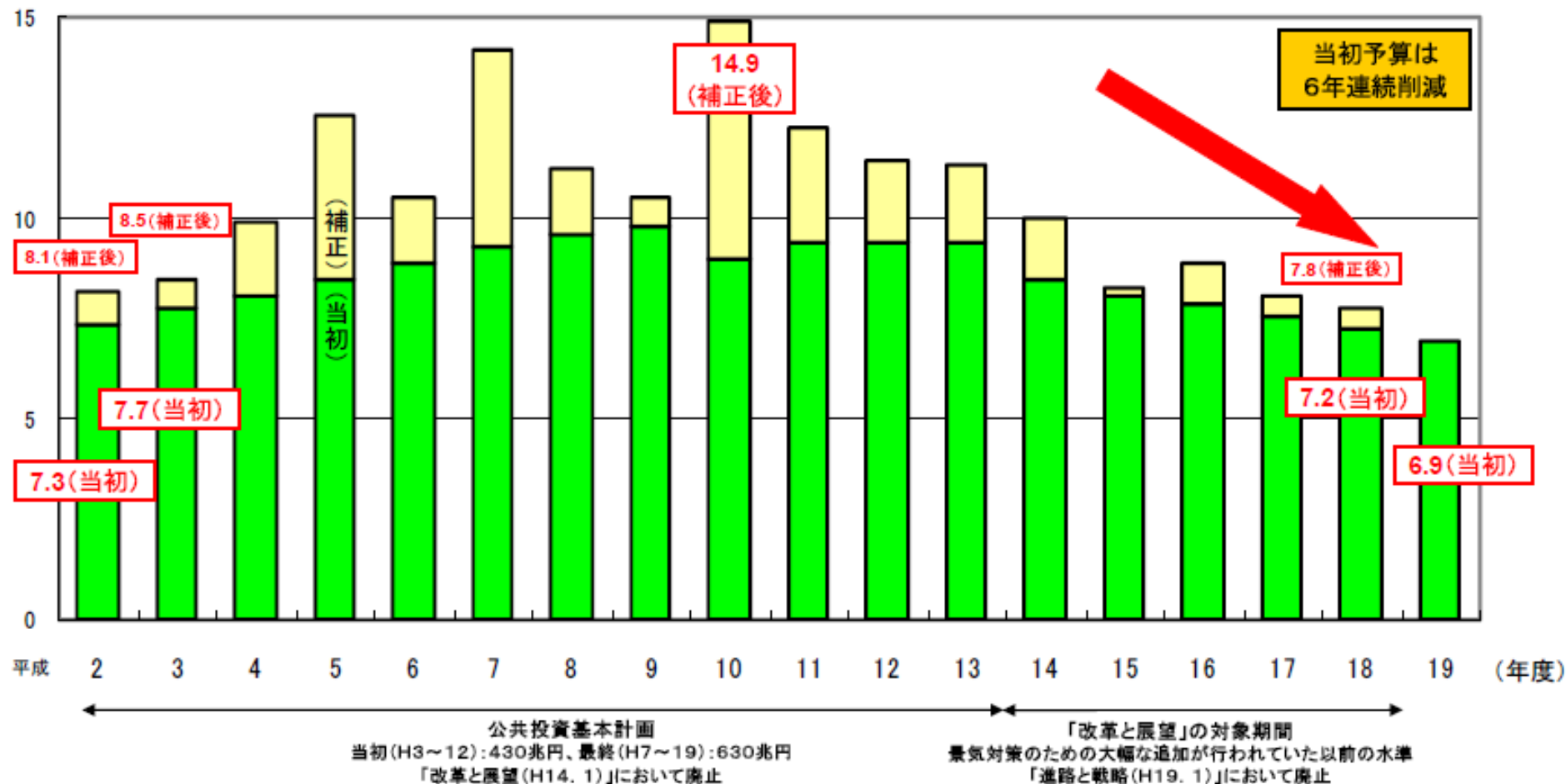
大成出版社「公共事業と予算」、  
「平成19年公共事業関係予算のポイント(政府案)」



# 公共事業関係費(国費ベース)



(兆円)

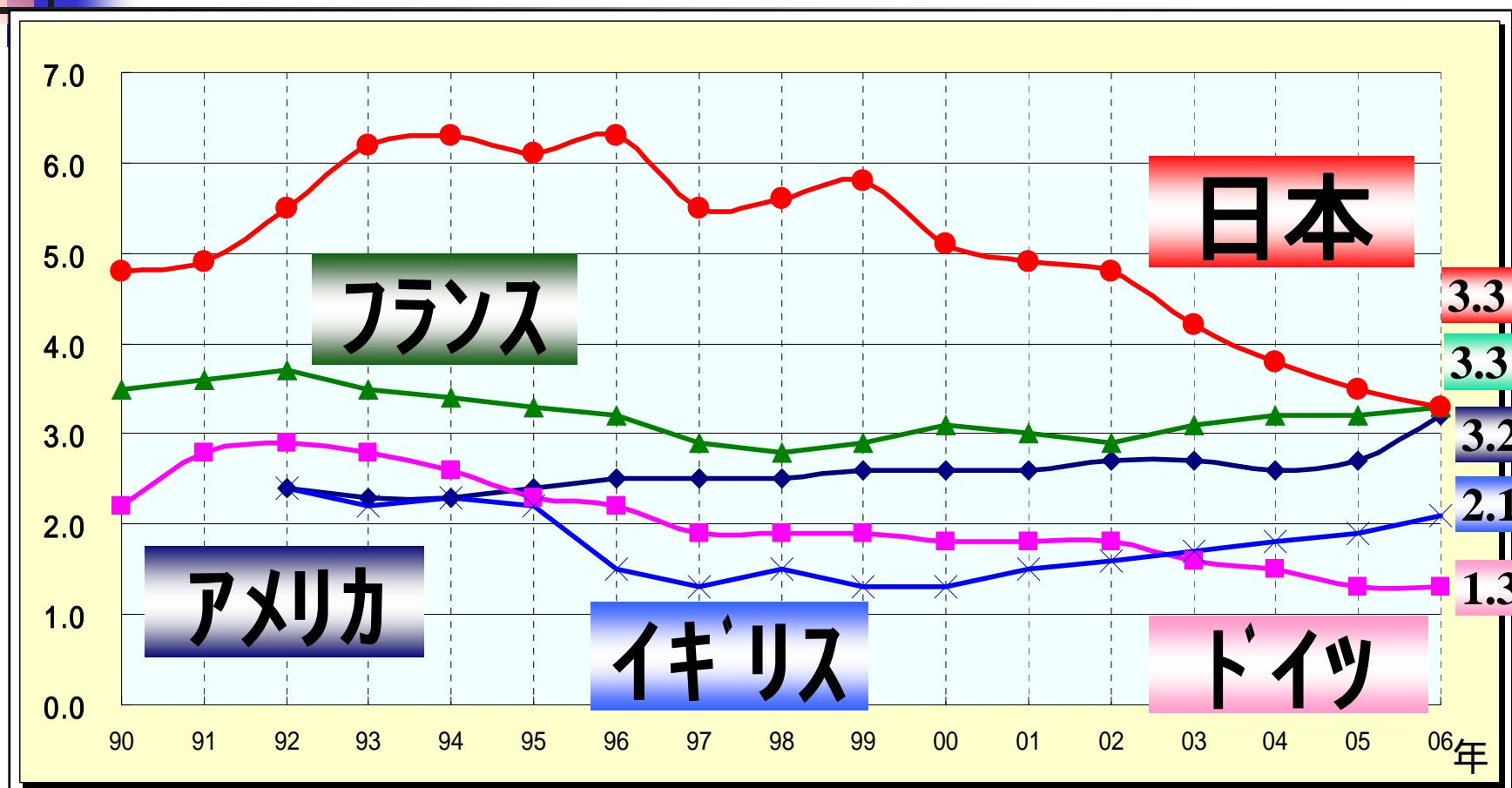


出典:建設産業政策2007(建設産業政策研究会最終報告書)



# 先進国における社会資本整備の投資水準

## 一般政府固定資本形成(対GDP比)



日本 : 平成2～16年は実績(2～15年はOECD National Account、16年は国民経済計算確報(年度ベース)による)

平成17、18年は推計(内閣府資料及び政府経済見通しより推計(年度ベース))

欧米諸国: 平成2～16年は実績(OECD National Accountより)、平成17、18年は(EU経済金融常任理事発行資料による)





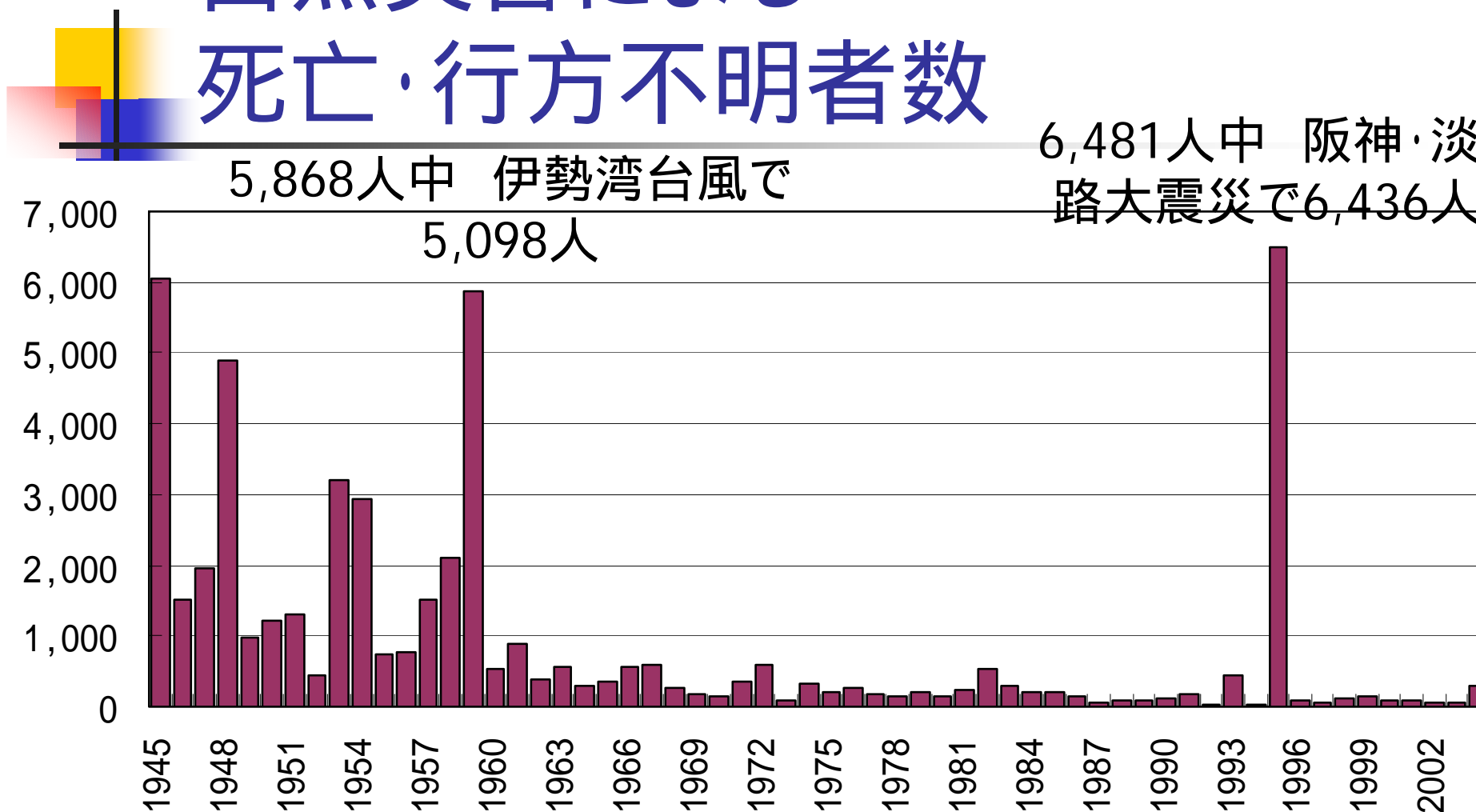
# 社会資本はこのままでいいのか？

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- 自然災害が多く地形が急峻
  - 外国との単純比較は不可能
- 不十分なストック
  - ナショナル・ミニマムに達せず
- 維持管理の軽視
  - 「荒廃する日本」のおそれ



# 自然災害による 死亡・行方不明者数

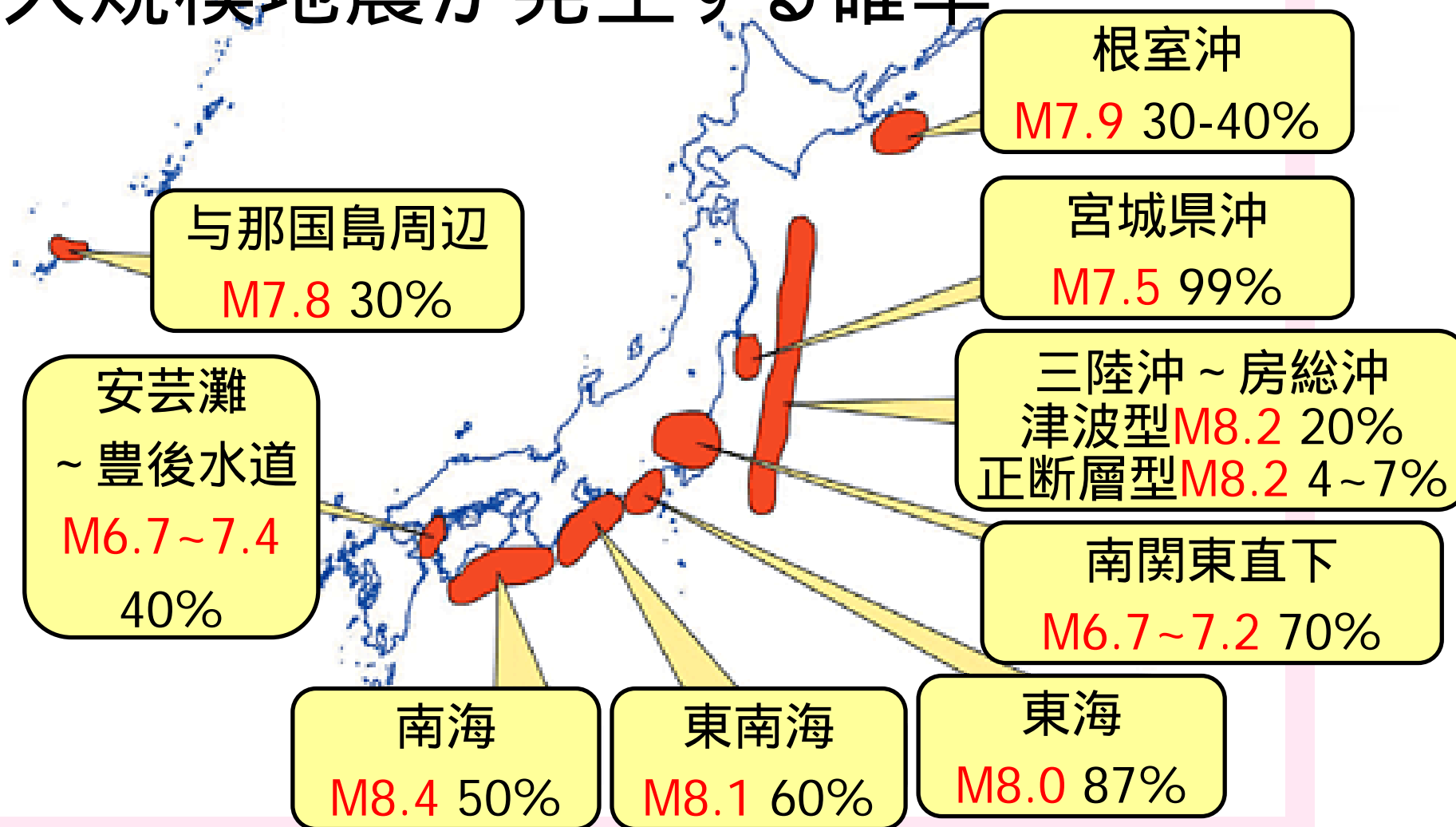


- (注) 1 1995年のうち、阪神・淡路大震災の死者については、いわゆる関連死912名を含む。  
2 阪神・淡路大震災の死者・行方不明者については、平成15年12月25日現在の数値。

資料) 平成17年度「防災白書」より作成



# 今後30年以内に 大規模地震が発生する確率







## 国民からの支持の低下の原因

- マスコミをにぎわせたダム等の不要論
- 関係者の反コンプライアンス的行為
- 社会資本が一定の水準に達したという誤解
- 土木技術者が発言しなかったこと





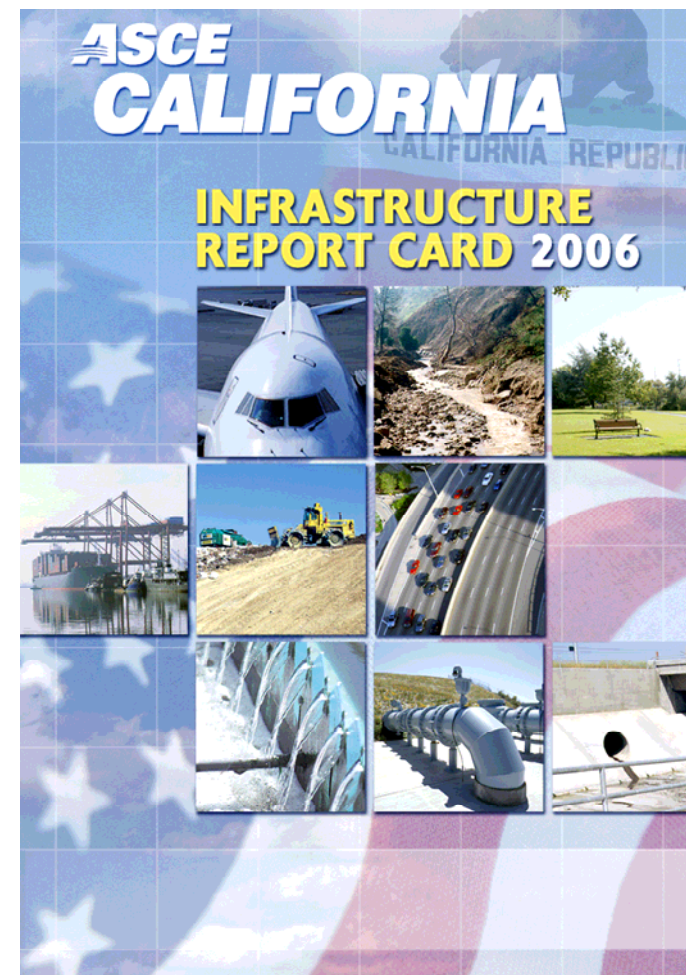
# 社会資本の国勢調査・健康診断 の意義

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- 客観的評価
  - 公共事業の削減の結果は？
- 土木技術の社会貢献の明確化
- 土木技術者が発言



# 海外の事例





# ミネアポリス高速道路橋梁 崩落事故



Photo by Tom Ruen



## Government Performance Project (米国) でのミネソタ州の評価

Maintenance of the state's roads in the last few years also has deteriorated in the face of inadequate funding. Many of Minnesota's roads were designed in the 1950s and can no longer accommodate the larger trucks; and, of course, the projections for growth done in the 1950s are no longer valid and the design of much of the system needs to be upgraded. DOT admits that it does not have a formal bridge preventive maintenance program, but is working on developing one under its Highway System Operations Plan that is slated to be completed in 2004.

橋梁の予防的維持管理プログラムがない



# “Report Card” ASCE (米国)



American Society of Civil Engineers

## Minnesota

### Top Three Infrastructure Concerns\*

1. Roads
2. Mass Transit
3. Bridges

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1015 15<sup>th</sup> Street, N.W., Suite 600  
Washington, D.C. 20005-2605  
(202) 789-2200  
Fax: (202) 289-6797  
Web: <http://www.asce.org>

### Key Infrastructure Facts

- 33% of Minnesota's roads are in poor or mediocre condition.<sup>1</sup>
- 16% of Minnesota's bridges are structurally deficient or functionally obsolete.<sup>1</sup>

2003年版ミネソタ州Report Cardでは、ミネソタ州内の橋梁の16%が構造的欠陥があるかもしくは陳腐化していると指摘していた。



# “Report Card” ASCE (米国)

2005 Grades			
Subject	2001 Grade	2005 Grade	Comments
Aviation	D	D+	Gridlock on America's runways eased from crisis levels earlier in the decade due to reduced demand and recent modest funding increases. However, air travel and traffic have reportedly surpassed pre-Sept. 11 levels and are projected to grow 4.3% annually through 2015. Airports will face the challenge of accommodating increasing numbers of regional jets and new super-jumbo jets.
Bridges	C	C	Between 2000 and 2003, the percentage of the nation's 590,750 bridges rated structurally deficient or functionally obsolete decreased slightly from 28.5% to 27.1%. However, it will cost \$9.4 billion a year for 20 years to eliminate all bridge deficiencies. Long-term underinvestment is compounded by the lack of a Federal transportation program.
Dams	D	D	Since 1998, the number of unsafe dams has risen by 33% to more than 3,500. While federally owned dams are in good condition, and there have been modest gains in repair, the number of dams identified as unsafe is increasing at a faster rate than those being repaired. \$10.1 billion is needed over the next 12 years to address <b>all critical</b> non-federal dams--dams which pose a direct risk to human life should they fail.
Drinking Water	D	D-	America faces a shortfall of \$11 billion annually to replace aging facilities and comply with safe drinking water regulations. Federal funding for drinking water in 2005 remained level at \$850 million, less than 10% of the total national requirement. The Bush administration has proposed the same level of funding for FY06.

A = Exceptional

B=Good

C=Mediocre

D=Poor

F=Failing

2005年は、2001年と比較して、**航空分野は“D”から“D+”に向上。** **水道は“D”から“D-”にランクダウン。**



# “The State of the Nation ” ICE (英国)



Grades at a glance

	2002	2003	2004	2005	2006
<b>Overall</b>	C-	D+	D+	D+	C-
<b>Energy</b>	C-	D+	D	D	D+
<b>Waste management</b>	D	D	D	D	C-
<b>Water and wastewater</b>	B	B+	B+	B+	B
<b>Flood management</b>	C	C+	C+	C+	C
<b>Transport</b>					
Rail	C-	D	C-	C	C
Roads	C+	C+	C+	C+	C+
Local transport	D+	-	C	C	C
Airports	-	-	B-	C-	C+
Seaports	-	-	B-	B-	B-

A = Good

B = Fair

C = Average

D = Poor

E = Bad

Grade

・各分野について **Change** を評価している。

**Sustainability**

・経年変化がわかるようにしている。



# Swedish Road Administration

“BaTMan”

$$BK = \sum_i \frac{K_i}{AP_i} * \frac{1}{A_{tot}}$$

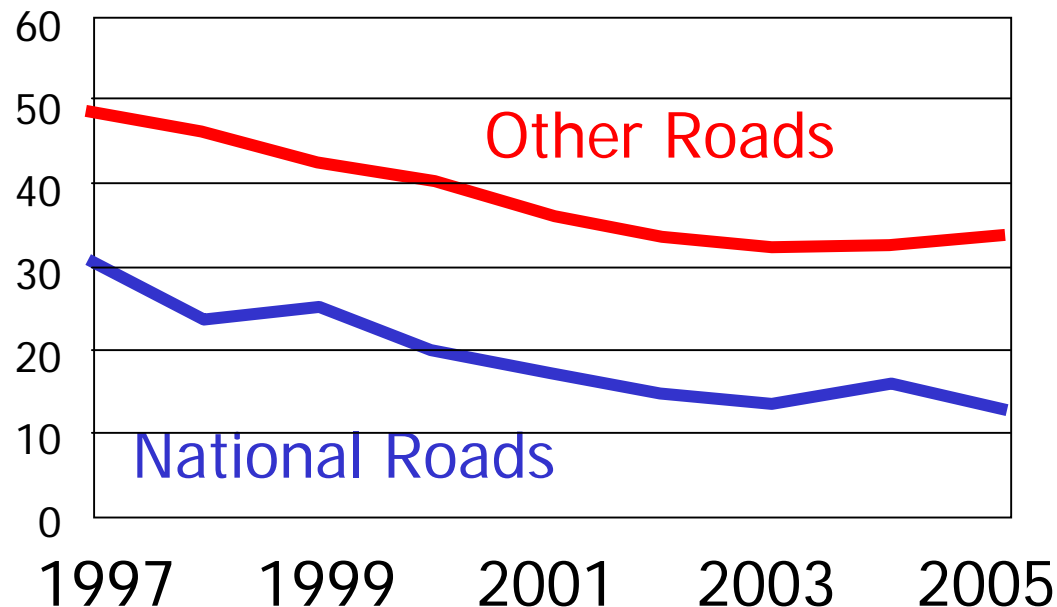
BK : Lack of Capital Value

$K_i$  : Cost of defective condition

$AP_i$  : Unit Price for replacement

$A_{tot}$  : Surface area for the entire bridge stock

Lack of Capital  
Value (LCV) = BK





# Report Card (南アフリカ)

Water	D+	Well maintained but ageing bulk infrastructure reaching end of useful life, and requires refurbishment or replacement. 43% of dams have safety problems and require urgent refurbishing. Serious concerns about funding.
	C+	South Africa is one of few nations where in most urban areas water can be drunk directly from the tap. Major, and ongoing, strides in provision of water and sanitation since 1994. However, erratic compliance with water quality requirements in most municipalities. Water wastage (leakage) is much too high. Shortage of skilled personnel.
	D-	
Sanitation (including wastewater)	C-	Serious problems with management of many wastewater (sewage) treatment works. Wastewater leakage and spillage much too high, and frequent problems with on-site sanitation. Inadequate operation and maintenance capacity, and shortage of skilled personnel. Major urban areas grade is pulled down by Cape Town and Sebokeng.
	E	
Solid waste management	C-	Landfill sites in major urban centres well managed, but many municipalities, especially rural municipalities, have uncontrolled dumpsites with attendant health risks. More widespread waste avoidance and recycling initiatives required.
	D	
Roads	C	Most in fair to very good condition, with recent strategic acquisitions in poorer shape. Increasing use of user-pays (tolling), but funding remains a challenge, especially given that key roads will soon require extensive refurbishing.
	D-	Generally inadequate funding and management systems leading to neglect of maintenance, combined with overloading, means that maintenance backlogs are growing. Less condition monitoring than in the past. Shortages of skilled personnel. Decisions have been taken to stop maintaining some roads.
Airports	B	World class aviation infrastructure provider, strongly driven by the need to meet legislated requirements. Delays and inconvenience due to continuous expansion to meet growth exceeding 10% p.a. A profitable company, and no shortage of funding.
Ports	C+	Proper management practices on ageing infrastructure have extended its useful life. Increased investment and support underway to address increased demand. Further improvement expected as Transnet profitability improves.
Rail	B	The iron ore and coal lines are world class and well maintained. Profitable. Where demand is approaching capacity, upgrading is programmed.
	C	Condition declined in recent years due to maintenance backlogs and skills reduction. Traffic volumes are increasing, and upgrading urgently required. Improvement expected as Transnet profitability improves.
	E	Low volume low priority lines in the process of being disposed of.
	D+	Gradual deterioration due to inadequate maintenance funding, reducing skills base, and vandalism, with resulting increased safety risks. Refurbishment underway. Improvement expected with the transfer to Department of Transport.
Electricity distribution	C+	Demand is nearly reaching the limit of generating capacity. Shortfall will get worse, before improving around 2011 when new base load stations commissioning. Eskom profitable, and no shortage of funding, but capital programme was delayed too long. Long and vulnerable transmission lines from Mpumalanga coalfields to urban centres. Risk of power cuts until the reserve increases.
	C+	Major, and ongoing, strides in provision of electricity since 1994 (this applies also to municipal distribution networks). State of (Eskom local distribution) infrastructure generally acceptable, but skills shortages.
	C-	Inadequate operation and maintenance capacity, and shortage of skilled personnel. In many areas, ageing and/or overloaded infrastructure. Improvements discernible. Grade pulled down by Johannesburg, although improvements also discernible there.
	D-	Same types of problems as in major urban areas, but significantly worse.
Hospitals and clinics	C	Improvement in some provinces, eg KZN and Limpopo, but deterioration in others, mainly due to inadequate maintenance funding, and inadequate skills and management systems. Revitalisation programme addresses some issues.
	D+	

## 4. The SAICE report card

SAICE investigated nine of the built environment infrastructure sectors, viz water (including water resources and water supply), sanitation and wastewater, solid waste management, roads, airports, ports (harbours), railways, electricity generation and distribution, and hospitals and clinics. Sectors not investigated include transport as in rolling stock and the operation of road and rail services, housing, schools, stormwater and flood management, and the natural environment. SAICE has also in respect of some of the sectors confined its attention to the most significant of the infrastructure only. For example in respect of airports, it investigated only the airports owned and operated by the Airports Company South Africa (ACSA), and in respect of harbours, only those owned by Transnet – whereas smaller airports and harbours are owned by others (including municipalities).

It is hoped that comparable reports will be issued at intervals in the future, and also that the range of sectors covered can gradually be widened. As noted above, subsequent reports will refer back to previous reports, such as this one, and will draw attention to trends, asking if the situation is improving, staying the same, or getting worse.

In compiling this report, SAICE has not undertaken primary research, but

has relied upon investigations and findings reported to it by its members, as selected and analysed on its behalf by its panel of experts.

## 5. Grading our built environment infrastructure

SAICE assigned letter-of-the-alphabet grades to six categories of public sector infrastructure. Each category was evaluated on the basis of condition and performance, and capacity versus need.

The grades can be interpreted as follows:

- A = very good
- B = good
- C = fair
- D = poor
- E = very poor.

Caution needs to be exercised in interpreting the report card table adjacent. The single symbols for each sector (e.g. water) hide huge variations in the condition and performance of the infrastructure within each sector. Water quality, for example, is excellent in the metropolitan areas (although there are invariably problems of ensuring reliable supply at all times, and water losses are often unacceptably high), but water quality in many more rural areas, including small towns, is frequently below the standards laid down.

Finally, an overall grade for built environment infrastructure as a whole:

Overall Grade	D+	Although South Africa's built environment infrastructure is very good, even world class in parts, the relatively poor overall grade reflects extensive maintenance and refurbishment backlogs. These backlogs are caused primarily by funding and skills shortages.
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# Report Card (豪州)



## Infrastructure Report Card Results

Infrastructure Type	Category	Sub-category	AUS 2005	AUS 2001	AUS 1999	NSW 2003	QLD 2004	VIC 2005	SA 2005	NT 2005	WA 2005	TAS 2005	ACT 2005
<b>Roads</b>		National	C+	C	C	C+	C+	C	C	B-	B-	B	
		State	C	C-	C-	C+	C	C-	C-	C-	B-	C	
		Local	C-	D	D	C-	C	C-	D	C-	C+	D+	
		Overall	C	C-	C-	C	C	C-	C-	C	B-	C	B
<b>Rail</b>			C-	D-	D-	D	C+	C-	C	A	C+		
<b>Electricity</b>			C+	B-		B	D+	C	B-	B-	B-	B-	B
<b>Gas</b>			C+	C			C	C	B+	A	B+		A-
<b>Ports</b>			C+	B			B-	C		B+	B-	B	
<b>Water</b>		Wastewater	C+	C-	D-	C-	C+	B	C	C	B-	D+	B
		Potable Water	B-	C	C-	C	B	B	C+	B-	B-	D+	C
		Stormwater	C-	D		D	C	C-	D	C+	C+	C-	C
		Irrigation	C-	D-			C+	D		B	C+		
		Overall	C	D+	C-	C-	C+	B-	C-	C+	C+	D	C+
<b>Airports</b>			B	B			B			B+			B
<b>Overall Rating</b>			<b>C+</b>	<b>C</b>	<b>D+</b>	<b>C-</b>	<b>C+</b>	<b>C</b>	<b>C</b>	<b>B</b>	<b>B-</b>	<b>C-</b>	<b>B-</b>



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# (社)土木学会が社会資本の国勢 調査・健康診断を実施する意義

- 学術的・客観的な立場からの調査
- 社会資本の問題点を提起
- 適正な公共投資水準に関する議論を喚起





## インフラの評価指標(道路)

### ■ 暮らし

- バリアフリー化率
- 無電柱化率 など

### ■ 安全

- 橋梁の耐震補強率
- 死傷事故率
- 歩道の設置率 など

### ■ 環境

- ガソリンの消費量 など

### ■ 活力

- 高規格道路利用率
- 渋滞による時間損失
- 道路改良率 など





## インフラの評価指標(河川)

### ■ 暮らし

- 渇水発生回数 など

### ■ 安全

- 洪水による氾濫から守られる区域の割合
- 洪水ハザードマップ作成市町村の割合 など

### ■ 環境

- 夏の水遊び利用者数
- 環境基準の達成割合 など

### ■ 活力

- 年間河川空間利用者数
- 「川の通信簿」の星の数 など



# 土木学会によるインフラ国勢調査・健康診断の方針

- 評価プロセスの公開
- 道路、河川、上下水道、鉄道、空港、港湾、海岸、都市、エネルギー等を網羅
- 継続的に評価を実施する仕組み・体制
- アウトカム指標
- 老朽化指標



Thank you very much !